306491

NORDA INC.
140 ROUTE 10
EAST HANOVER, MORRIS COUNTY, N.J.
EPA ID# NJD001307115

GENERAL INFORMATION AND SITE HISTORY

The Norda Inc. plant site occupies approximately 17 acres in East Hanover Township, Morris County, New Jersey. The site is located on Block 96, Lots 81, 82, and 99.3, situated between Route 10 and Murry Road in a commercial area of East Hanover. The site is bounded to the east by a drum recycling company, on the west by a motel and golf driving range, on the north by Murry Road and a warehouse complex, and on the south by Route 10. There are few homes within 0.5 mile of the site. The population within 1 mile of the site is estimated to be 1400. The population living within 4 miles of the site is approximately 52,000 people.

Documentation indicates that, beginning prior to 1947, until the present time, raw materials for the flavors and fragrances industry have been manufactured at the site. The current owner of the site, PPF International obtained the property pursuant to a sale agreement between Norda and PPF in 1985. The transfer of plant ownership provided the impetus for an ongoing ECRA site investigation and remediation program.

SITE OPERATIONS

Existing structures on the site include several buildings which consist of storage, maintenance, administrative, laboratory and processing facilities. Processes run at the site include: repackaging of ingredients used in the manufacture of flavors and fragrances, liquid blending of perfume and aroma chemicals, extraction of natural fruits and vegetables with isopropanol or ethanol, distillation of flavor oils, liquid blending of flavor materials and research and development. The research and development laboratories also function to provide quality control data for the above processes. (Attachments B & E)

Aqueous waste is generated when equipment is washed, prior to a change being made to a new process. The wash water is collected in sumps located near the manufacturing buildings. Thereafter, it is pumped to aboveground indoor tanks for storage until it is removed as hazardous waste. Other above ground and below ground tanks are used to hold petroleum products and process materials. (For a list of hazardous substances found at the facility, refer to Attachment E, Appendix E.)

In accordance with an Administrative Consent Order, signed by Norda in January 1985, Dames and Moore, the company's environmental consulting firm, has been conducting site investigation and remedial activities following plans that were submitted and approved by NJDEP, Bureau of Environmental Evaluation and Cleanup Responsibility (ECRA). Site investigations by Dames and Moore resulted in the designation of eleven areas of environmental concern where contamination had or potentially had occurred. The following are areas which have been investigated and sampled: (See Summary of Sampling Data for results).

1. Three sumps used to collect and contain process waste water.
2. Seven septic systems.
3. Fire pond area south of Buildings D and B-1.
4. Drum cleaning area located north of Building 22.
5. Fill area between Murry Road and the plants northern fence line.
6. Disposal area along eastern fence line in which drums containing process materials were buried.
7. Building No. 1 and Platform No. 7 which were damaged by historical fires.
8. Site catch basins.
9. Dumpster area.
10. Catch basin at Vehicle Maintenance Building.
11. Facility fuel oil tanks. (Attachments A and B)

Most of the investigation and remedial activities at the site have been associated with location and removal of approximately 3500 drums containing process waste and aromatic still bottoms that were buried during the 1960s. The drums were divided among five clusters, or cells, buried at a depth of 5 to 10 feet below grade. Remediation of the drum disposal areas have included the removal of the buried drums, along with 3000 yards of contaminated soil and 160,000 gallons of perched water. Post removal sampling was conducted and additional contaminated soil was removed from the excavation prior to backfilling with clean fill in 1987. All clean up activities have been completed under the review and approval of NJDEP, Bureau of Industrial Site Evaluation. (Attachments B-H)

GROUNDWATER ROUTE

The eastern one-third of Morris County, in which East Hanover is located, lies in the Piedmont Physiographic Province. The province is characterized as a region of low lying plains and gently sloping hills with occasional basal ridges. Altitudes of the region are 200 to 400 feet above mean sea level while site altitudes range from 200 to 220 feet MSL.

The Norda site overlies the Triassic Brunswick Formation, which consists of shales and sandstones forming the uppermost member of the Newark Group. Glacially derived tills, sands, gravels and clays of low permeability overlie the permeable alluvial deposited bedrock.

Both the Brunswick Formation and the overlying glacial deposits serve as primary aquifers in the East Hanover area. The Norda site has nine monitoring wells in which the static water level ranges from approximately 40 to 56 feet below the surface. However, low permeability clay deposits may result in surface ponding and/or perched groundwater conditions in some areas of the site. Analysis of samples, collected from the monitoring

wells in 1984, disclosed total volatile organic compound (VOC) concentrations as high as 4953 ppb. Trichloroethylene and 1,1,1-trichloroethane were the primary contaminants.

There are seventeen domestic, five production and two municipal wells within 1.0 mile of the site. Approximately 800 residences in East Hanover are supplied by domestic wells which range from 50 to 150 feet in depth. The Township water system included four wells. Municipal Wells No. 1 and 2 are located approximately 1,800 feet west of the Norda site. East Hanover has water-line interconnections with the Florham Park Water Department and the Southeast Morris Municipal Utilities Authority. Secondary interconnections also exists with the Madison Water Department and the Commonwealth Water Company which serves Millburn and Chatham Townships. A total of 44 municipal supply wells are located within 4 miles of the site. Wells in this area generally screened either in the Pleistocene Age stratified drift, or in the Brunswick Formation. Municipal supply wells screened in the stratified drift range from 66 to 150 feet in depth while wells screened in the Brunswick Formation are generally deeper, ranging from 115 to 470 feet in depth. The East Hanover System supplies approximately 8000 people. Due to the number of interconnections of different water supply systems in the area, it was not possible to accurately determine the population served by wells within a 4 mile radius of the site. Based on the populations of the municipalities connected to the supply system, the total population served by groundwater within 4 miles of the site is estimated to be 100,000.

A regional groundwater contamination problem exists in the aquifers of the East Hanover area. As of 1987, NJDEP was investigating 38 groundwater pollution sites, including Norda, within East Hanover Township and its immediate vicinity. The Buried Glacial Valley Aquifers in the East Hanover area have been designated a Sole Source Aquifer by USEPA. The NJDEP has delineated the entire Township of East Hanover a Well Restriction Area. Contaminants found in groundwater throughout the area include trichloroethlylene (TCE), trichloroethane (TCA), chloroform, trans-1,2-dichloroethylene, 1,1-dichloroethylene, benzene, methylene chloride, toluene, ethyl benzene and tetrachloroethylene. (Attachment J)

SURFACE WATER ROUTE

PPF International Inc. discharges non-contact cooling water and storm run-off to an unnamed ditch that discharges to the Whippany River which is approximately 0.5 mile west of the site. PPF's NJPDES permit number for this discharge is NJ003154. Process waste water and water collected from floor drains are held in one of four holding tanks and removed approximately four times a week. Since May, 1986 PPF has been tied into the Par-Troy Sewage Treatment Plant.

No information was found during the documentation search to indicate that any discharges of hazardous materials to surface water have occurred. However, soil samples collected from drainage ditches on the site have been shown to be contaminated by petroleum hydrocarbons (370 ppm), toluene (334 ppb) and methylene chloride (481 ppb). These results indicate that there is a potential for surface water contamination to have occurred in the past. (Attachment D)

The Whippany River in the vicinity of the site is used for recreational fishing. There are no surface water intakes for potable supply within 5 miles of the site.

AIR ROUTE

PPF's NJDEP, Division of Environmental Quality, Air Pollution Permit Plant ID # is 25039. The facility's stack log lists eight exhaust systems, four of which were deleted in 1985. Documentation indicates that PPF-Norda has been investigated on several occasions due to odor complaints. There is further potential for air release due to volatile nature of materials used at the site. (Attachment G)

FIRE/EXPLOSION CONDITIONS

Two fires which occurred in 1947 and in 1960 are thought by Dames and Moore to be potential sources of contamination at the site. Similar flammable materials are still used during manufacturing process indicating that the potential for fire still exists. (Attachments E & H)

DIRECT CONTACT

The facility is surrounded by an 8-foot high fence and has gates at both entrances limiting the potential for direct contact of hazardous materials on site. However, if contaminated runoff entered culverts that lead off site, a potential for direct contact may exist. (Attachments B-D & M)

OTHER CONSIDERATIONS

Contaminants found in soil and potentially in surface water discharges may impact upon flora and fauna. Contamination of the food chain is unlikely due to the nature of the contaminants.

The Whippany River flows through an extensive wetlands area known as the Passaic Valley - Troy Meadows. State of New Jersey endangered and threatened wildlife species associated with this area include Bog Turtle, the Short-Billed Marsh Wren and the Blue-Spotted Salamander and Tremblay's Salamanders which in New Jersey are restricted to the Passaic River Valley Watershed.

Unstable containment and illegal disposal of waste have been documented. In 1968 approximately 3500 drums containing process waste were buried on site. (Attachments B, H, L)

A preliminary assessment (PA), completed January 31, 1986, assigned a high priority to the Norda site for inspection.

SUMMARY OF SAMPLING DATA

1. A. Sampling Date: January-February 1986 (Attachments D & F)

B. Sampled by: Dames and Moore
Cranford, New Jersey

C. Samples: 28 Soil
1 Surface Water

D. Laboratories:

Sixteen soil samples and one surface water sample were analyzed by Environmental Testing and Certification (ETC), Edison, New Jersey. NJDEP Lab Certification ID# 12257.

The remaining twelve soil samples were analyzed by Century Laboratories, Inc., Thorofare, New Jersey. NJDEP Lab Certification ID# 08153.

E. Parameters:

1. Priority Pollutant Volatile Organic Compound with +15 search - all samples.

2. Additionally analyzed for Total Petroleum Hydrocarbons - one sample collected from the north catch basin (NCB).

3. Full Priority Pollutant Compounds with +40 search - two samples.

F. Sample Description:

Soil samples were collected from borings ranging from depths of 1 to 44 feet below grade at locations outlined on Table 1.

G. Contaminants Detected:

Analysis of samples collected during this sampling period revealed the presence of the following contaminants at the locations listed below:

Location	Contaminant	Concentration ppb
Bldg. 27 Sump SB104S	toluene	62.5
Fire Pond SB108-55	toluene	3110
	ethylbenzene	229
	benzene	134
Catch Basin NCB	petroleum hydrocarbons	370 (ppm)
Catch Basin VM	toluene	33.4

Location	Contaminant	Concentration ppb
Drum Cell #4 (Bottom)	benzene	2,000
	toluene	2,000
	dichlorobenzene	56,000
	phenol	9,000
	1,2-dichlorobenzene	12,000
	1,2-diphenylhydrazine	110,000
	nitrobenzene	140,000
Drum Cell #4 (Sidewall 3)	benzene	500
	ethylbenzene	3,000
	toluene	2,000
	total xylene	17,000
	1,2-dichlorobenzene	7,000
	1,2-diphenylhydrazine	150,000
	nitrobenzene	660,000

H. QA/QC:

Field and trip blanks were collected during each sampling event and chain of custody documentation accompanied all sample shipment. The laboratories were NJDEP certified, and as such, copies of their standard operating procedures are on file with NJDEP.

2. A. Sampling date: May 16-17, 1988 (Attachment B)

B. Sampled by: Dames and Moore

C. Samples: 10 Groundwater

D. Laboratory: ETC, Edison, New Jersey
NJDEP Lab Certification ID# 12257

E. Parameters:

Samples were analyzed for priority pollutant volatile and base/neutral compounds with forward library search.

F. Sample Description:

Samples were collected from nine monitoring wells (See figure for monitoring well locations).

G. Contaminants Detected:

Location	Contaminant	Concentration ppb
MW1	carbon tetrachloride	7.26
	chloroform	15.34
	1,2-dichloroethane	17.0
	methylene chloride	15.5

Location	Contaminant	Concentration ppb
MW2	1,2-trans-dichloroethylene	22.95
	trichloroethylene	252.0
MW5	1,1-dichloroethane	9.43
	1,1-dichloroethylene	44.5
	1,1,1-trichloroethane	677.0
	trichloroetrylene	165.0
MW7	methylene chloride	19.9
	trichloroethylene	6.89

H. QA/QC:

Field and trip blanks were collected during each sampling event and chain of custody documentation accompanied all sample shipments. The laboratory (ETC) is NJDEP certified, and as such, copies of their standard operating procedures are on file with NJDEP. Laboratory data was provided in Tier II format.

CONCLUSIONS/RECOMMENDATIONS

The sampling data that was reviewed for the Norda site confirms the contamination of soil and groundwater at the site by volatile organic compounds. The sampling data and documentation also indicate the potential for surface water and air contamination.

Due to the extensive amount of sampling conducted during the sites ongoing ECRA investigation, further sampling under CERCLA is not warranted. It is recommended that any further action be deferred to the NJDEP Bureau of Environmental Evaluation Cleanup and Responsibility Assessment (~~ECRA~~ BEECRA) for continued action.

NORDA DOCUMENTATION

Maps

1 USGS Quadrangle Map

2 Site Map

3 Tax Map

4 NJ Atlas Base Map

5 Geologic Overlay

6 Water Supply Overlay

7 Drainage Overlay

8 Computer Generated Water Withdrawal Map

Document	Date	Source
A. Administrative Consent Order	January 16, 1985	NBFO Haz. Waste
B. ECRA Cleanup Plan	August 2, 1988	ECRA
C. Attenuation Study and Cleanup Plan Recommendations	June 22, 1987	ECRA
D. ECRA Sampling Plan Results	May 5, 1986	ECRA
E. ECRA Submission Appendix B-E (Processes, Storage, Hazardous Materials)	Undated	ECRA
F. Soil Sampling Results and Cleanup Plan Recommendations Cell No. 4 Excavation	April 7, 1986	ECRA
G. Data Submittal ECRA Sampling Plan	March 4, 1986	ECRA
H. Geohydrologic Investigation	November 7, 1984	ECRA
I. NJPDES Draft Permit and Fact Sheet	Undated	NBFO DWR
J. New Jersey Geological Survey Technical Memorandum 87-3 Ground-water Contamination and the Delineation of a Well Restriction Area in East Hanover Township	1987	NJDEP DWR
K. Air Pollution Investigations	1982 & 1988	NBFO Air
L. Illegal Dumping Investigations	1984-1985	E. Hanover H.D.
M. Memo to File: Winshield Survey	1987	BPA

Source Locations

ECRA - NJDEP Bureau of Environmental Cleanup Responsibility Assessment

DWR - NJDEP Division of Water Resources, Bureau of Groundwater Pollution Assessment

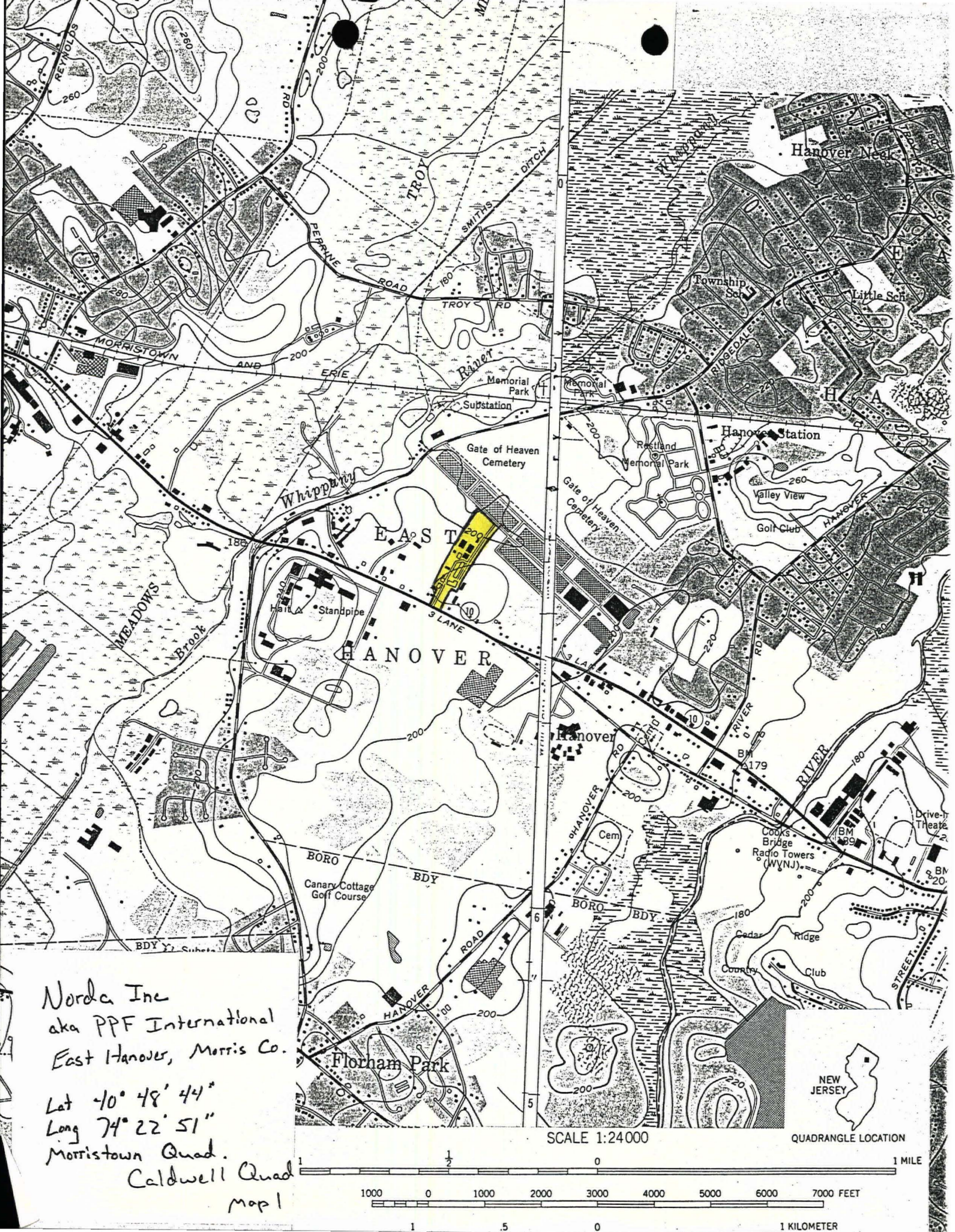
NBFO Haz Waste - NJDEP Division of Waste Management Northern Field Enforcement Office

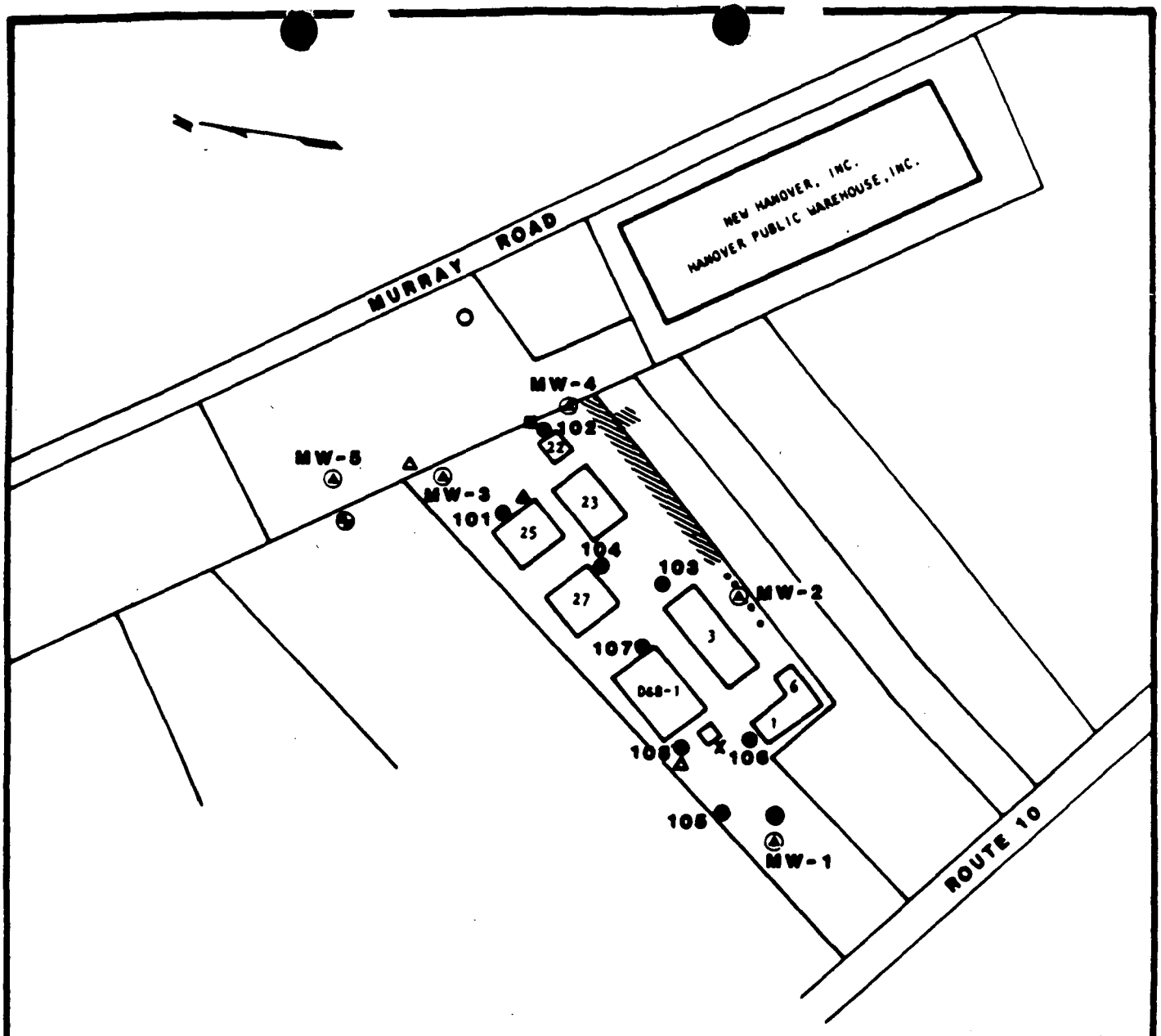
NBFO DWR - NJDEP Division of Water Resources Northern Field Enforcement Office

NBFO Air - NJDEP Division of Environmental Quality Northern Field Enforcement Office (Air)

E. Hanover H.D. - East Hanover Department of Health

BPA - NJDEP Bureau of Planning and Assessment


Norda Inc
aka PPF International
East Hanover, Morris Co.
Lat 40° 48' 44"
Long 74° 22' 51"
Morristown Quad.
Caldwell Quad
map 1
HANOVER
EAST
Florham Park
Hanover
Hanover Station
Hanover Neck
Gate of Heaven Cemetery
Memorial Park
Substation
Standpipe
Canary Cottage Golf Course
Cooks Bridge Radio Towers (WVNJ)
Cedar Ridge Country Club
Valley View Golf Club
Township Sch
Little Sch
Restland Memorial Park
Whippany River
Troy Meadows
Brook
Troy Road
Perrine Road
Smiths Ditch
Morristown and Erie
Ridgedale
Hanover Road
3 Lane
BORO BDY
BM 179
BM 189
NEW JERSEY
QUADRANGLE LOCATION
SCALE 1:24000
1 MILE
7000 FEET
1 KILOMETER



SITE PLAN
AREA DESIGNATIONS
ECRA SAMPLING PLAN
ADRON - EAST HANOVER, N.J.

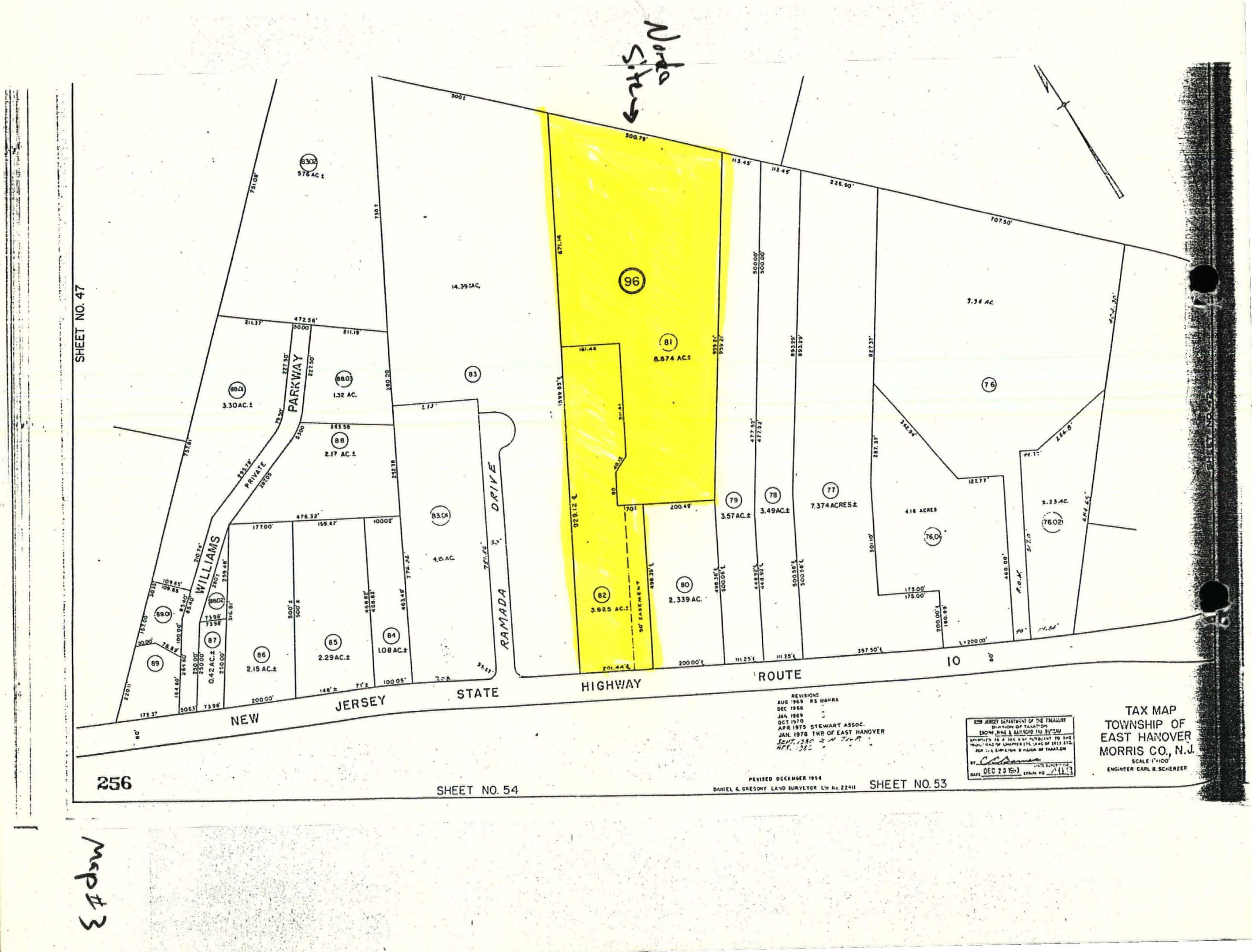
K E Y:

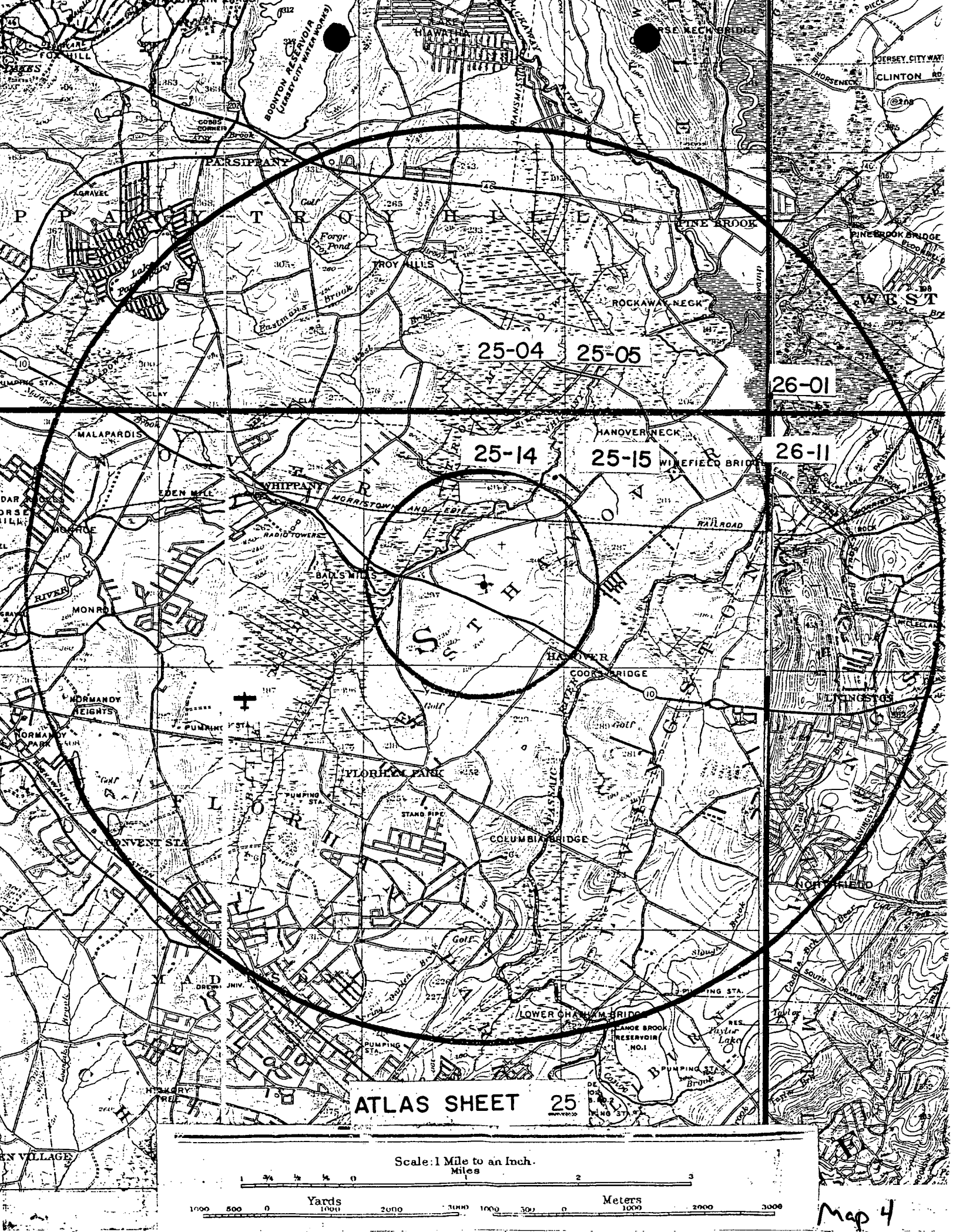
	◍	MONITORING WELL INSTALLED PREVIOUSLY BY DAMES & MOORE
105	●	AREAS S-1, S-2 & S-3
	■	AREA S-4
	◒	AREA S-5
	○	AREA S-5
	▨	AREA S-6
	••••	AREA S-7
	△	AREA S-8
	▲	AREA S-9
	x	AREA S-10
	●	AREA A

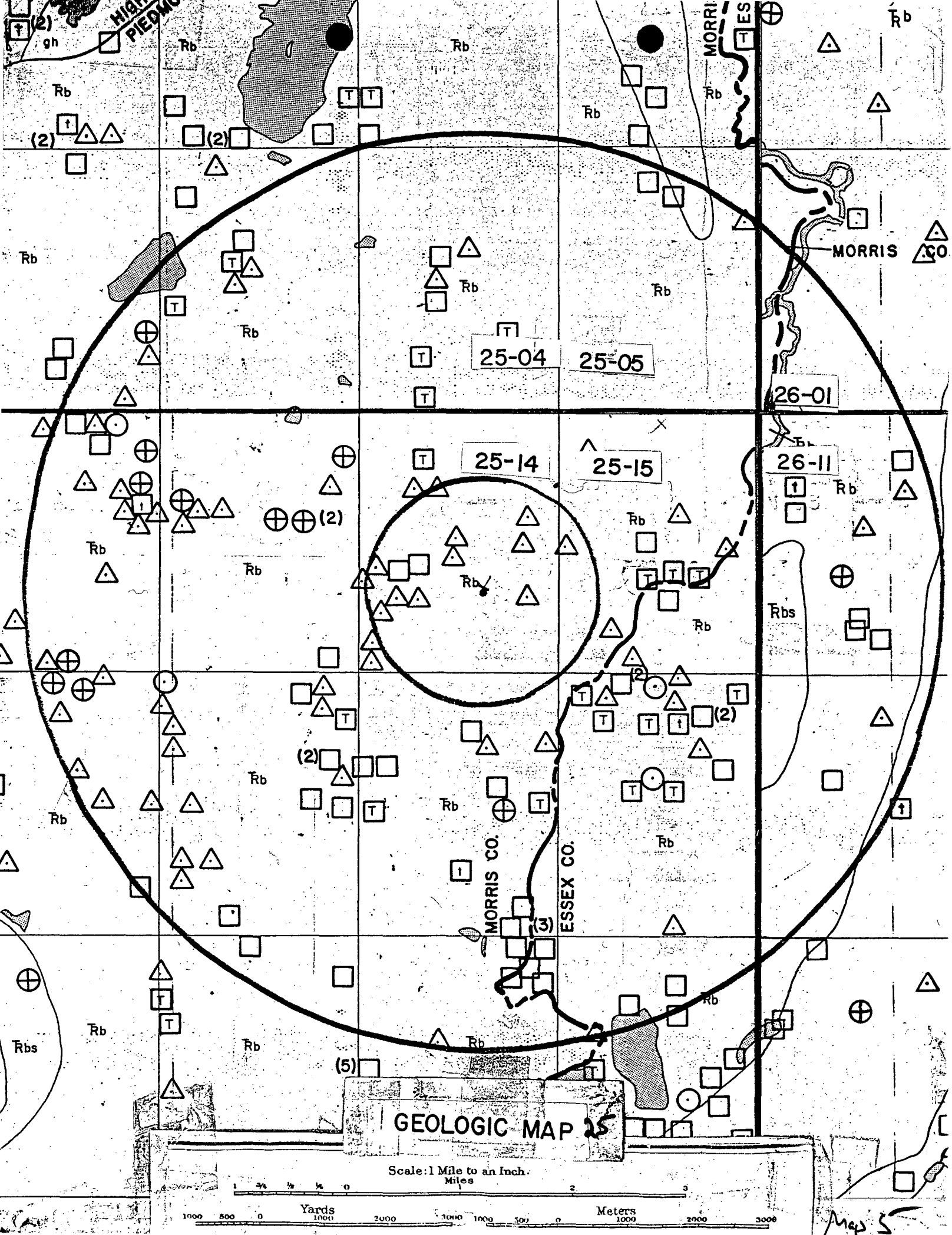
Map 2

DAMES & MOORE

Area Designation	Description
S-1	Three sumps used to collect and contain process wash water
S-2	Septic systems
S-3	Fire pond area south of Buildings D and B-1
S-4	Drum cleaning area located northeast of Building No. 22
S-5	Fill area between Murray Road and the plant's northern portion of the plant containing scattered, buried drums
S-6	Disposal area along eastern fence line in which drums containing process materials were buried in discrete cells
S-7	Building No. 1 and Platform No. 7 which were damaged by historical fires
S-8	Northern catch basin
S-9	Dumpster
S-10	Catch basin at Vehicle Maintenance Building
S-11	Stained soil at fuel oil tanks
A	Background soil quality area located near plant entrance from Route 10
B	Ground water quality on-site


Norda Site
SHEET NO. 47
WILLIAMS
PRIVATE PARKWAY
RAMADA DRIVE
NEW JERSEY STATE HIGHWAY ROUTE 10
96
81
8.874 AC.±
82
3.925 AC.±
50' EASEMENT
80
2.339 AC.
79
3.57 AC.±
78
3.49 AC.±
77
7.374 ACRES±
76
76.01
4.16 ACRES
76.021
83
14.39 AC.
83.01
4.15 AC.
83.02
5.76 AC.±
88.01
3.30 AC.±
88.03
1.32 AC.
88
2.17 AC.±
88.02
89.01
87
0.42 AC.±
89
86
2.15 AC.±
85
2.29 AC.±
84
1.08 AC.±
REVISIONS
AUG 1965 R.S. MAHRA
DEC 1966
JAN 1969
OCT 1970
APR 1975 STEWART ASSOC.
JAN. 1978 TWP. OF EAST HANOVER
NEW JERSEY DEPARTMENT OF THE TREASURY
DIVISION OF TAXATION
DEC 23 1983
TAX MAP
TOWNSHIP OF
EAST HANOVER
MORRIS CO., N.J.
SCALE 1"=100'
ENGINEER: CARL B. SCHERZER
REVISED DECEMBER 1954
DANIEL G. GREGORY LAND SURVEYOR Lic. No. 22411
256
SHEET NO. 54
SHEET NO. 53
Map #3


25-04
25-05
26-01
25-14
25-15
26-11
ATLAS SHEET 25
Scale: 1 Mile to an Inch.
Miles
Yards
Meters
PARSIPPANY
TROY HILLS
ROCKAWAY NECK
PINE BROOK
HANOVER NECK
WHIPPANY
MORRISTOWN AND EBIE RAILROAD
BADS MILLS
FLORHAM PARK
COLUMBIA BRIDGE
LOWER CHATHAM BRIDGE
HANOVER
COOKS BRIDGE
LIVINGSTON
NORTHFIELD
MALAPARDIS
EDEN MILL
MONROE
NORMANDY HEIGHTS
CONVENT STA.
HICKORY TREE
BOONTON RESERVOIR (JERSEY CITY WATER WORKS)
HAWATHA
CLINTON
WEST
Map 4


25-04
25-05
26-01
25-14
25-15
26-11
MORRIS CO.
ESSEX CO.
Rb
Rbs
(2)
(3)
(5)
T
GEOLOGIC MAP 25
Scale: 1 Mile to an Inch.
Miles
Yards
Meters

LEGEND FOR ATLAS SHEET 25 (GEOLOGY)

△ — INDUSTRIAL WELL YIELD OVER 70 GALLONS PER MINUTE (INCLUDING PRIVATE WELLS)

□ — PUBLIC SUPPLY WELL YIELDING OVER 70 GALLONS PER MINUTE

⊕ — UNSUCCESSFUL ROCK WELL YIELDING LESS THAN 70 GALLONS PER MINUTE

⊙ — UNSUCCESSFUL SAND WELL YIELDING LESS THAN 70 GALLONS PER MINUTE

⊡ — NO TEST – NO DATA ON YIELD

——— FAULT (DASHED WHERE INFERRED)

——— CONTACT (DASHED WHERE INFERRED)

PHYSIOGRAPHIC PROVINCE BOUNDARY

WATER SUPPLY TRANSMISSION LINE

NOTE: WHERE THE PRECAMBRIAN FORMATION BOUNDARIES TERMINATE ABRUPTLY, IT IS THE GEOLOGIST'S OPINION THAT THE GEOLOGICAL COMPLEXITY OF THE AREA PREVENTS FURTHER INTERPRETATIONS.

Kmr — CRETACEOUS MAGOTHY AND RARITAN FORMATIONS (SAND AND CLAY)

T_Rb — TRIASSIC BRUNSWICK FORMATION

T_Rc — TRIASSIC CONGLOMERATE BEDS OF THE STOCKTON FORMATION

T_Rl — TRIASSIC LOCKATONG FORMATION

$T_R$db — TRIASSIC DIABASE

$T_R$bs — TRIASSIC BASALT FLOWS

Sd — SILURIAN DECKER LIMESTONE AND LONGWOOD SHALE FORMATIONS

Sgp — SILURIAN GREEN POND CONGLOMERATE

Omb — ORDOVICIAN MARTINSBURG SHALE

ϵOk — CAMBRO ORDOVICIAN KITTATINNY LIMESTONE

ϵh — CAMBRIAN HARDYSTON SANDSTONE

PRECAMBRIAN:

gh – HORNBLENDE GRANITE WITH PYROXENE GRANITE

ga – ALASKITE

am – AMPHIBOLITE

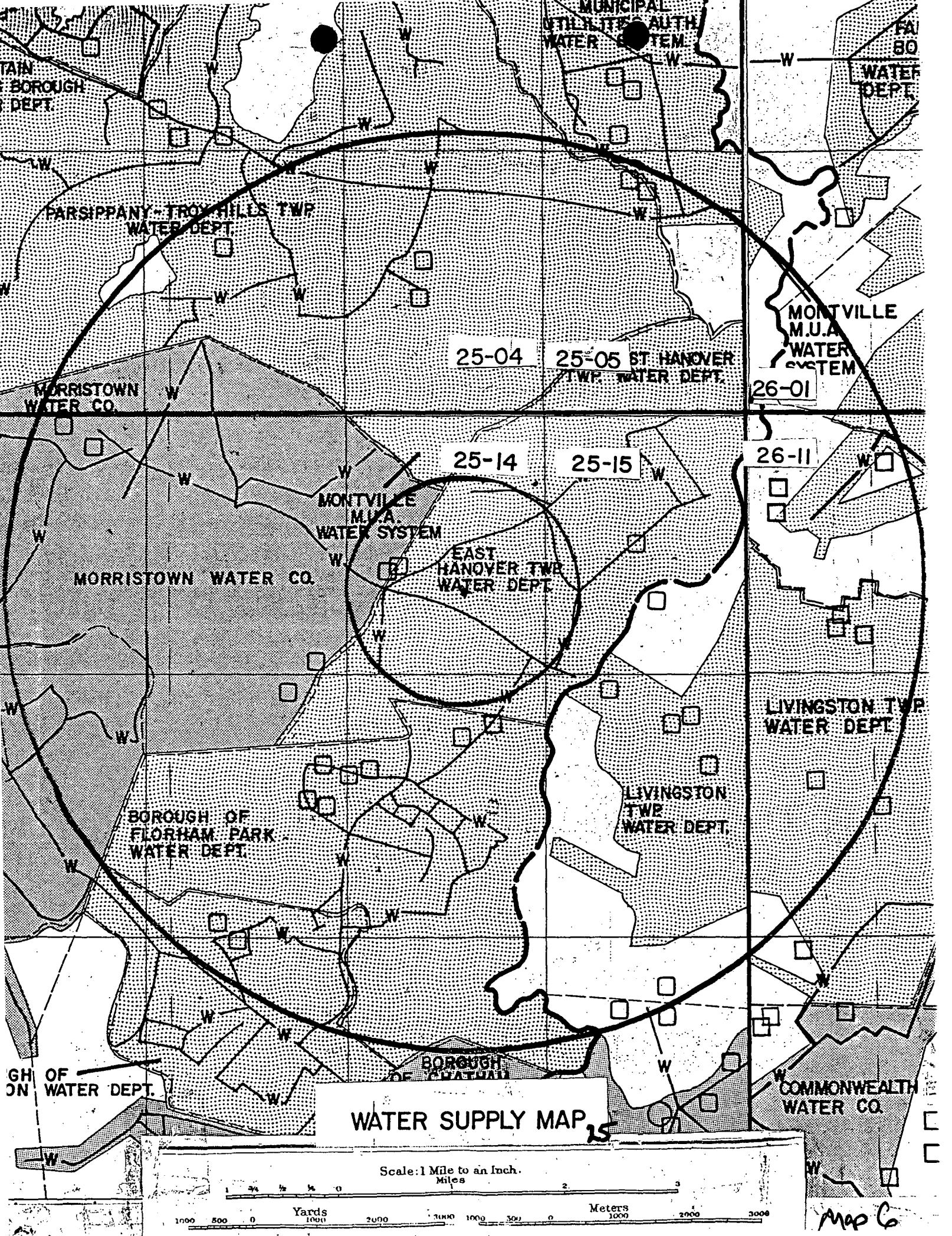
px – PYROXENE GNEISS

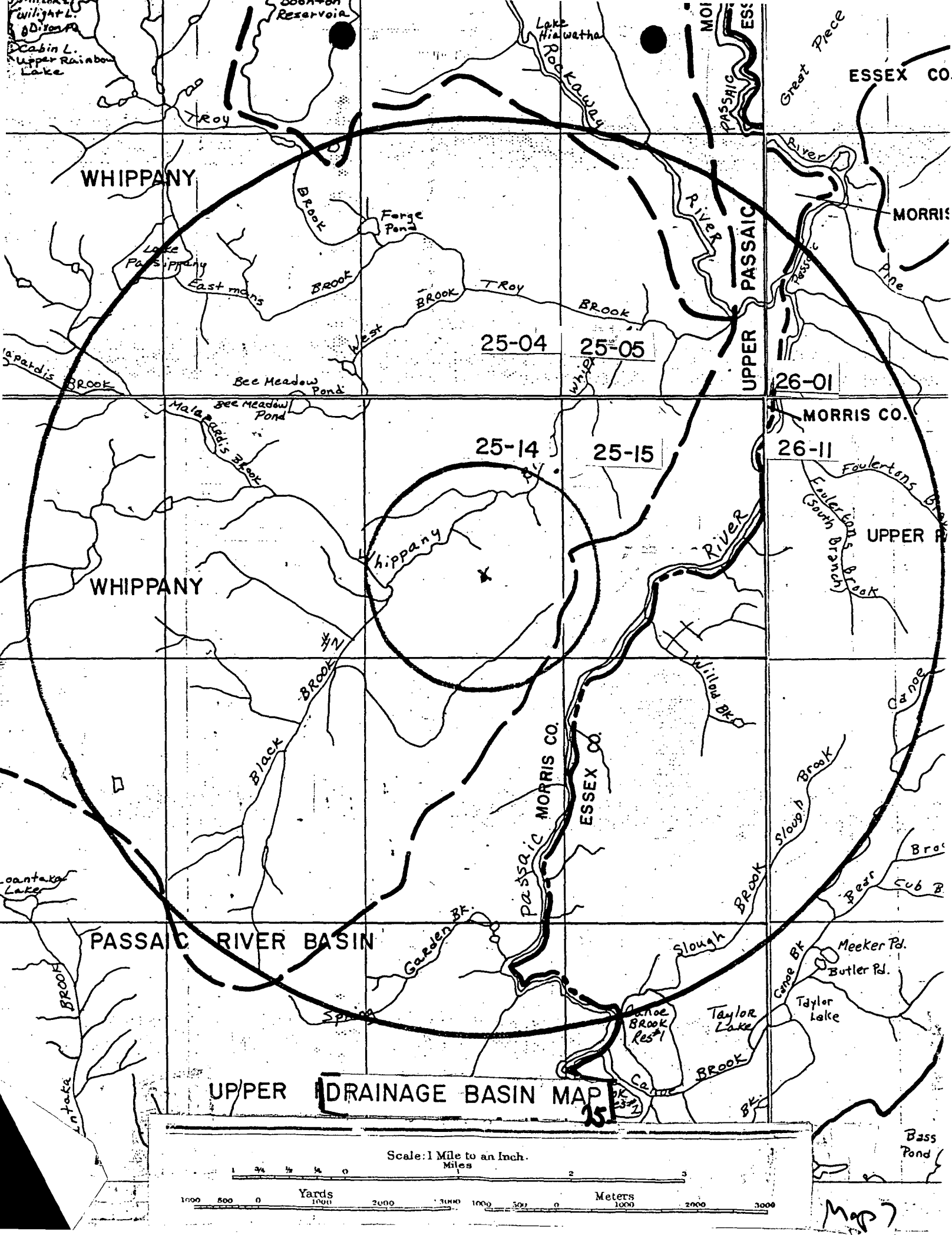
gnq – QUARTZ PLAGIOCLASE GNEISS

gnb – BIOTITE GNEISS

sk – SKARN, GRAPHITE SCHIST

fnd — FORMATION NOT DETERMINED


MUNICIPAL UTILITIES AUTH. WATER SYSTEM
BOROUGH DEPT.
PARSIPPANY-TROY HILLS TWP. WATER DEPT.
25-04
25-05
ST. HANOVER TWP. WATER DEPT.
MONTVILLE M.U.A. WATER SYSTEM
MORRISTOWN WATER CO.
26-01
25-14
25-15
26-11
MONTVILLE M.U.A. WATER SYSTEM
EAST HANOVER TWP. WATER DEPT.
MORRISTOWN WATER CO.
LIVINGSTON TWP. WATER DEPT.
BOROUGH OF FLORHAM PARK WATER DEPT.
LIVINGSTON TWP. WATER DEPT.
BOROUGH OF CHATHAM
COMMONWEALTH WATER CO.
WATER SUPPLY MAP 15
Scale: 1 Mile to an Inch.
Miles
Yards
Meters
Map 6


WHIPPANY
WHIPPANY
PASSAIC RIVER BASIN
UPPER DRAINAGE BASIN MAP
25
25-04
25-05
25-14
25-15
26-01
26-11
MORRIS CO.
ESSEX CO.
UPPER PASSAIC
Lake Hiawatha
Rockaway River
Troy
Forge Pond
Lake Pocahontas
East mans Brook
Troy Brook
West Brook
Bee Meadow Pond
Malapardis Brook
Whippany River
Foulertons Brook
Foulertons (South Branch) Brook
Willow Brk
Canoe Brook
Slough Brook
Black Brook
Passaic
Garden Brk
Spring Brook
Meeker Pd.
Butler Pd.
Taylor Lake
Canoe Brook
Bass Pond
Bear
Cub
Great Piece
Cabin L.
Upper Rainbow Lake
Scale: 1 Mile to an Inch.
Miles
Yards
Meters
Map 7

BLOCK #26-01

A. Caldwell, Orange, Paterson, Pompton Plains

B. Passaic-Lower Passaic, Pompton, Upper Passaic

C. 2.

Map No.	Location	Period of Record
417	Passaic River at Pine Brook	1966-
3. 243	Passaic River at Millington off Rt.512	1964-
246	Passaic River at Two Bridges	1962-
252	Pompton River at Two Bridges	1963-

Water Quality Standards: (explained in Atlas Sheet description)
FW1 except where classified FW3

D. Brunswick Formation (Trb), Basalt Flows (Trbs)

E. 1. Physiographic Province: Piedmont
Subdivision: Triassic Lowlands
Major Topographic Features: Red Sandstone Plain, Watchung Ridges, Passaic Valley
Elevations (ft.above sea level): ridges 690, valleys 150
Relief (ft.): 550

2. a. Normal Year: 49"
Dry Year: 42"
Wet Year: 61"

b. January: 30°F
July: 73°F

c. 241 days. Last killing frost: 4/25; first killing frost: 10/20

F. Div. of Parks and Forestry:
Great Piece Meadows
Passaic County:
Preakness Valley Park
Essex County:
West Essex Park

H. Grover Cleveland Birthplace
Wayne Museum/Van Ripper-Hopper House, Wayne
Dey Mansion, Wayne
Van Duyne House, Wayne
Colfax House, Wayne

I. Water Well Records

Location	Owner	Year Drilled	Screen Setting or Depth of Casing	Total Depth	g/m Yield	Formation
26-01-128	Lincoln Park Water Co.			610	200	Trb
26-01-153	Evans Water Co.			100	53	Trbs
26-01-163	Shauger, W.			510	10	Trb
26-01-168	Lincoln Parks, Boro of	1965	32	430	125	"
26-01-223	Union Carbide Co.	1962	81	81	15	Q
26-01-223	"	1962	50	63	0	Q-Trb
26-01-231	"	1962	84	350	No test	Q
26-01-237	Mack Moulding Co.			400	75	Trb
26-01-238	"			80	35	Q-Trb
26-01-238	"			400	75	"
26-01-259	Mountain View Water Co.			214	105	Trb-Trbs
26-01-265	Twp. of Wayne			?	No test	Q
26-01-266	Liverpool Realty	1964	111	200	20	Trb
26-01-268	Boro of Lincoln Park	1965	100	120	300	Q
26-01-298	Chemway Corp.	1956	69'7"	92	360	"
26-01-313	Packanack Lake Ctry.Club	1962	31	200	225	Trb
26-01-338	Twp. of Wayne	1965	100	400	151	"
26-01-339	"			?	No test	Q
26-01-371	"	1962	Pulled	85	"	"
26-01-373	"	1967	33	447	40	Trb
26-01-374	Mead Industries, Inc.	1959	86	306	80	Trbs-Trb
26-01-376	Chemway Corp.	1958	45	50	10	Q
26-01-377	"	1956	62	90	400	"
26-01-377	"			?	No test	"
26-01-378	Passaic Rubber Co.	1969	118	423	"	Trb
26-01-378	Chemway Corp.	1956	73'4"	91	50	Q
26-01-379	"			?	No test	"
26-01-444	Green Meadows Ctry.Club	1966	30	395	40+	Trb
26-01-457	Helcar Corp.	1966	90	300	150	"
26-01-486	Montville Warehouse Co.	1964	13/18	345	120	Trbs-Trb
26-01-517	Boro of Fairfield	1968	111'8"	250	35	Trb
26-01-529	Chester Builders	1965	90	300	246	"
26-01-539	Sundance Lodge	1960	100	250	120	"
26-01-541	Boro of Fairfield	1967	115'10"	225	167	"
26-01-549	Fairfield Twp.	1964	68	279	250	"
26-01-585	Caldwell Wright Airport			340	150	"
26-01-589	Greenbrook Ctry.Club	1957	53-1/4	300	335	Trbs
26-01-589	"	1967	85	415	35	Trb
26-01-599	"			553	27	Trbs
26-01-625	Willow Brook Sports Center	1956	40	480	60	Trb
26-01-627	Plastic Service Corp.	1956	36	470	75	"
26-01-683	Davega			1004	6	Trbs
26-01-728	Twp. of Fairfield	1964	85/68	350	500	Trb
26-01-739	Rich-Tex Inc.	1964	46	300	283	"
26-01-762	Ferncliffe Golf Club	1955	79	305	90	"
26-01-816	Mountain Ridge Country Club			252	85	Trbs
26-01-849	Essex Fells, Boro of			250	200	"
26-01-849	"			283	105	"
26-01-849	"			183	240	"
26-01-854	"	1957	84'1-3/4"/ 100	254	262	"

26-01-861	Elm Tree Swimming Pool			206	200	Trbs-Trb
26-01-871	Crane, Stuart			250	90	Trbs
26-01-898	Mt. St. Dominic Academy			876	25	Trb
26-01-914	Dugan			280	80	Trbs
26-01-965	Essex County Hospital			124	110	Trb
26-01-965	"			130	135	"
26-01-965	"			128	120	"
26-01-965	"			588	96	"
26-01-965	Overbrook Hospital	1957	117	125	198	Trbs

J. Geodetic Control Survey monuments described
Index Maps 14,15,20,21

BLOCK #26-11 8/76

A. Caldwell, Elizabeth, Orange, Roselle

B. Arthur Kill-Rahway, Elizabeth; Passaic-Lower Passaic, Upper Passaic

C. 1. Cranford - Non-recording temperature and precipitation gauges

2. Map No.	Location	Period of Record
38	Peckman Brook at Verona Lake, Verona	7/23/45
3. 245	Passaic River near Livingston (Rt.10)	1964-
253	Peckman River at Verona (Rt. 506)	1964-

Water Quality Stations: (explained in Atlas Sheet description)
FW2 except where classified FW3

D. Brunswick Formation (Trb), Basalt Flows (Trbs)

E. 1. Physiographic Province: Piedmont
Subdivision: Triassic Lowlands
Major Topographic Features: Red Sandstone Plain, Watchung Ridges, Passaic Valley
Elevations (ft.above sea level): ridges 650, valleys 250
Relief (ft.): 400

2. a. Normal Year: 48"
Dry Year: 43"
Wet Year: 57"

b. January: 31°F
July: 74°F

c. 241 days. Last killing frost: 4/20; first killing frost: 10/20

F. Essex County:
West Essex Park
Eagle Rock Reservation
South Mountain Reservation
East Orange:
Municipal Watershed
Orange City:
Municipal Watershed

G. National Park Service - Edison National Historical Site

H. Edison National Historic Site, West Orange

I. Water Well Records

Location	Owner	Year Drilled	Screen Setting or Depth of Casing	Total Depth	g/m Yield	Formation
26-11-118	Boro of Essex Fells	1957		96	No test	Q
26-11-134	"	1956		190	95	Trb
26-11-137	Resistoflex Corp.	1968	76	305	250	"
26-11-142	Essex Fells, Boro of			200	255	Q-Trb
26-11-152	Polander, M. & Son	1968	124'9"	389	221	Trb
26-11-157	Kidde, W. & Co.			405	30	"
26-11-185	Twp. of Livingston	1955	66'10"	442	97	"
26-11-185	"	1955	88'10"	313	230	"
26-11-186	"	1955	68'7"	384	290	"
26-11-211	Boro of Essex Fells	1959	61	89	457	Q
26-11-212	"			260	0	Trbs
26-11-213	"			300	0	"
26-11-221	"			248	10	"
26-11-224	"			295	400	Trb
26-11-225	"			80	25	Q
26-11-256/9	"			43	120	"
26-11-266	Nichols, C.W.			510	25	Trbs
26-11-354	Eagle Rock Mfg. Co.			841	110	"
26-11-359	Montclair Golf Club	1964	16	500	138	Trb
26-11-426	A&P	1954		298	145	"
26-11-451	Twp. of Livingston	1955		291	412	"
26-11-464	"	1964	107	114	No test	Q
26-11-512	Whalen, S.(U.S.Cigar Store)			502	60	Trbs
26-11-546	Rahway Water Dept.	1966	22/40	269	390	Trb
26-11-599	Rock Springs Country Club	1956	19'9"	406	25	Trb-Trbs
26-11-611	Essex Co.Country Club	1965	62'11"	72	715	Q
26-11-645	"	1954	21	115	100	Trbs
26-11-668	Nickel Alkaline Battery Div.	1961	46	520	190	Trb
26-11-669	Tell Mfg. Co., Inc.			500	120	"
26-11-695	Carl Del'Spina & Co.	1958	25	400	330	"
26-11-913	East Orange, City of	1958	68	102	700	Q
26-11-717	"	1958	81'9"	116	775	"
26-11-717	"	1958	78	110	700	"
26-11-728	"	1962	125'4-1/2"	171	20	"
26-11-735	St.Barnabas Medical Ctr. 1961		32	819	170	Trbs-Trb
26-11-793	City of Orange			75	1040	Q
26-11-796	"			14	0	Trbs
26-11-797	"			104	700	Q
26-11-819	"	1966	73'6"	132	1404	"
26-11-833	Rock Springs Country Club	1957	22	750	35	Trbs-Trb
26-11-847	City of Orange			99	1480	Q
26-11-896	Village of South Orange			355	220	Trb
26-11-923	Orange Products	1960	35'3"	500	257	"
26-11-933	Orange Water Dept.	1958	35	551	300	"
26-11-939	City of Orange	1967	56'3"	550	350	"
26-11-943	Village of South Orange	1956	45	350	560	"
26-11-945	"			301	400	"
26-11-957	"	1956	21'10"	343	350	"
26-11-971	"			122	275	"

J. Geodetic Control Survey monuments described
Index Maps 20,21,25,26

BLOCK #25-04,05 8/76

A. Boonton, Caldwell, Morristown, Pompton Plains

B. Passaic-Pompton, Rockaway, Upper Passaic, Whippany

C. 1. Boonton - Non-recording temperature and precipitation gauges

2.

Map No.	Location	Period of Record
15	Rockaway River above Reservoir at Boonton	1937-
16	Rockaway River below Reservoir at Boonton	1903-1904, 1906-

3.

257	Rockaway River at Boonton (Rt.202)	1964-
259	Whippany River at Rockaway Neck	1965-
269	Rockaway River at Parsippany-Troy Hills (Rt.46)	1968-

Water Quality Standards: (explained in Atlas Sheet description) FW2

D. Brunswick Formation (Trb), Triassic Conglomerates (Trc), Basalt Flows (Trbs), diabase (Trdb), biotite-quartz-feldspar gneiss (qnb), hornblende granite with pyroxene granite (gh), quartz-plagioclase gneiss (gng), pyroxene gneiss (px)

E. 1. Physiographic Province: New England (Reading Prong)
Subdivision: N.J. Highlands
Major Topographic Features: Passaic Range
Elevations (ft.above sea level): ridges 850, valleys 150
Relief (ft.): 700

2. a. Normal Year: 47"
Dry Year: 34"
Wet Year: 61"

b. January: 29°F
July: 72°F

c. 235 days. Last killing frost: 5/5; first killing frost: 10/5

F. Div. of Parks and Forestry:
Great Piece Meadows
Troy Meadows Natural Area
Essex County:
West Essex Park
Morris County:
Tourne Park
Boonton Reservoir:
Municipal Watershed

H. Doremus House, Towaco

I. Water Well Records

Location	Owner	Year Drilled	Screen Setting or Depth of Casing	Total Depth	g/m Yield	Formation
25-04-123	Montville Twp. M.U.A.	1973	249	252	120	Qsd
25-04-133	Town of Boonton			12	0	Q
25-04-136	"			113	100	"
25-04-136	"			64	0	"
25-04-156	Town of Boonton (Well point System)	1964		55	600	Qsd
25-04-159	Town of Boonton	1958	75	100	300	"
25-04-178	Boro of Mountain Lakes			50	200	Q
25-04-178	"			58	232	"
25-04-216	Air Craft Radio Corp.	1955	65	80	150	Qsd
25-04-295	Drew, E.F. & Co.			305	190	Q
25-04-296	"			110	100	"
25-04-296	"			402	100	"
25-04-354	S.B. Penick & Co.	1970	67	252	75	PC
25-04-371	Drew, E.F. & Co.			313	235	"
25-04-371	"			505	25	"
25-04-374	"			416	13	"
25-04-422	Boro of Mountain Lakes			186	-	Q-PC
25-04-429	Hillcrest Water Co.			469	140	PC
25-04-429	"			422	85	"
25-04-429	Boro of Mountain Lakes			58	589	Q
25-04-429	"			60	500	"
25-04-429	"			60	500	"
25-04-445	"	1969	260	333	1200	Qsd
25-04-446	"	1966	300	345	437	"
25-04-446	"			257	-	Q
25-04-446	"			137	-	"
25-04-467	"	1964	61	207	128	PC
25-04-489	International Pipe & Ceramics	1963	141	160	831	Qsd
25-04-489	U.S.G.S.			80	-	Q
25-04-489	"			81	-	"
25-04-497	International Pipe & Ceramics	1963	161	200	350	Qsd
25-04-524	Norda Essential Oil & Chem.Co.			822	38	PC
25-04-524	"			385	220	"
25-04-574	Parsippany-Troy Hills,Twp.of			179	100	Q
25-04-578	"	1958	105	138	600	Qsd
25-04-587	"			82	500	Q
25-04-587	"			150	150	"
25-04-596	"			85	-	"
25-04-598	"	1973	60-85	96	1100	Qsd
25-04-626	Knoll Golf Club			240	90	Trb
25-04-635	Charles Ackerman (for school)	1953	43	100	70	PC
25-04-674	Twp.of Parsippany-Troy Hills			107	-	Q
25-04-677	"			80	1000	"
25-04-723	"			169	100	Trb
25-04-771	Lwewellen Farms Restaurant			210	0	Q
25-04-785	Parsippany-Troy Hills Water Dept.	1975	114-134	172	620	Qsd
25-04-785	"	1974	89-109	112	453	"
25-04-793	"	1964	66	75	0	Trb

25-04-796	U.S.G.S.	1965		89	255	Trb
25-04-798	"	1966		84	500	"
25-04-813	Leeming-Pacquin	1967	65	80	430	Qsd
25-04-815	Parsippany-Troy Hills	1966	70	100	525	"
25-04-847	U.S.G.S.			79	-	Q
25-04-851	Twp.of Parsippany-Troy Hills			92	-	"
25-04-851	"	1958	55	65	715	Qsd
25-04-854	Sunran Corp.	1957	75	95	100	"
25-04-854	"	1957	52	81	300	"
25-04-951	Twp.of Parsippany-Troy Hills	1966	36	47	835	"
25-04-952	U.S.G.S.	1966	-	213	272	"
25-04-954	Rowe Manufacturing Co.	1955	74	86	400	"
25-04-957	Twp.of Parsippany-Troy Hills	1965	55	80	530	"
25-04-976	U.S.G.S.			52	-	Q
25-04-979	"			64	-	"
25-04-991	"			109	-	"
25-05-419	Montville Mun.Utilities	1966	19	293	106	Trb
25-05-425	John Pellock	1971	20	170	?	"
25-05-432	Forest Wood Const. Co.	1965	30	275	159	"
25-05-469	U.S.G.S.			173	-	Q
25-05-481	Montville Mun. Util.	1966	55	210	70	Trb
25-05-485	Pine Brook Water Co.	1956	15	300	190	"
25-05-487	Montville Mun. Util.	1966	34	176	87	"
25-05-725	Twp.of Parsippany-Troy Hills	1956	54	90	350	Qsd
25-05-725	"			70	900	Q
25-05-739	O'Dowd Dairies			530	77	Q-Trb
25-05-776	Twp. of East Hanover	1966	118	285	440	Trb

J. Geodetic Control Survey monuments described
Index Maps 14,20; adjacent Index Maps 13,19

BLOCK #25-14,15 1/77

A. Caldwell, Chatham, Morristown, Roselle

B. Arthur Kill-Rahway
Passaic-Upper Passaic, Whippany

C. 1. Canoe Brook - Non-recording precipitation, evaporation, and temperature gauges

2.

Map No.	Location	Period of Record
12	Canoe Brook near Summit	1930-1960
18	Whippany River at Morristown	1921-

3.

18	Whippany River at Morristown	-
244	Passaic River at Chatham (Rt.24)	1964-
258	Whippany River at Rockaway Neck	1965-

Water Quality Standards: (explained in Atlas Sheet description) FW2

D. Brunswick Formation (Trb), Basalt Flows (Trbs)

E. 1. Physiographic Province: Piedmont
Subdivision: Triassic Lowlands
Major Topographic Features: Wisconsin Terminal Moraine, Red Sandstone Plain, Passaic Valley
Elevations (ft.above sea level): ridges 450, valleys 180
Relief (ft.): 250

2. a. Normal Year: 49"
Dry Year: 43"
Wet Year: 61"

b. January: 29°F
July: 72°F

c. 238 days. Last killing frost: 5/5; first killing frost: 10/15

F. Division of Parks and Forestry:
Troy Meadows Natural Area
Essex County:
West Essex Park
Union County:
Passaic River Park
Morristown Water Department:
Municipal Watershed
East Orange:
Municipal Watershed
Chatham Borough:
Municipal Watershed
Commonwealth Water Co.:
Private Water Shed

G. National Park Service:
Morristown National Historical Park
U.S.Fish and Wildlife Service:
Great Swamp National Wildlife Refuge

I. Water Well Records

Location	Owner	Year Drilled	Screen Setting or Depth of Casing	Total Depth	g/m Yield	Formation
25-14-121	New Jersey Bell Telephone	1966	200	198	85	Trb
25-14-123	The Mennen Co.	1968	87	110	100	Q
25-14-123	Morristown, City of			136	1000	"
25-14-129	The Mennen Co.	1968	60	100	300	"
25-14-131	Town of Morristown	1955	144	144	1550	"
25-14-131	"			115	0	"
25-14-136	Whippany Paper Board Co.	1966	100	193	26	Trb
25-14-138	Allied Chemical Co.			67	204	Q
25-14-139	"			345	10	Trb
25-14-162	Whippany Paper Board Co.			97	550	"
25-14-163	"			72	560	"
25-14-163	"	1974	61-66	66	No test	Qsd
25-14-163	"	1974	43-63	63	626	"
25-14-167	Rayonier Inc.	1955	109'4"	129	320	Trb
25-14-174	Wallace & Tiernan	1967	183'9-1/2"	500	104	"
25-14-176	U.S.Geological Survey	1967	76	148	105	Q
25-14-177	Tech-Art Plastics Co.	1961	143	163	70	"
25-14-178	T. Landi & Son	1955	39	48	90	"
25-14-188	Mepco Inc.	1966	140	140	168	"
25-14-189	Weinberger, N.	1966	211	219	22	"
25-14-236	Rowe Mfg. Co.			400	15	Trb
25-14-238	Suburban Propane Gas Co.	1963	65	75	120	Q
25-14-242	McEwan Bros.			50	900	"
25-14-242	"			50	400	"
25-14-242	Whippany Paper Board Co.			50	40	Trb
25-14-243	"	1960	91	400	325	"
25-14-253	"	1964	55	500	45	"
25-14-261	"			530	50	"
25-14-261	"			985	50	"
25-14-298	City of Morristown			122	1500	Q
25-14-316	U.S.Geological Survey	1966		110		"
25-14-319	First Marketing Corp.	1965	81	120	349	"
25-14-327	Hanover Sewerage Auth.			50	110	"
25-14-347	Aquex Dev.& Sales Corp.			118	125	"
25-14-347	Route 10 Gas Station			78	150	"
25-14-348	Twp. of East Hanover			130	484	"
25-14-349	"			115	1500	"
25-14-355	Jersey Central Power & Light			600	170	Trb
25-14-355	"			40	1500	Q
25-14-362	Calculgraph Co.	1959	96'5"	106	146	"
25-14-365	Gate Haven Cemetery			303	300	Q-Trb
25-14-372	Sandoz Pharmaceutical Co.	1966	112	132	524	Q
25-14-372	U.S.Geological Survey	1966	113	122	360	"
25-14-373	Sandoz Pharmaceutical Co.			85	521	"
25-14-377	U.S.Geological Survey	1966	60'+3'	69	317	"
25-14-377	"	1966	101'5-1/2"	112	348	Trb
25-14-392	Two Guys from Harrison	1962	70	70	400	Q
25-14-422	Johnson & Johnson			602	37	Trb
25-14-423	Desiderio, T.			855	45	"
25-14-425	Allied Chemical Co.			188	517	Q

25-14-431	Morristown Memorial Hospital	1956	187'6"	504	290	Trb
25-14-441	"	1959	147'9"	507	325	"
25-14-442	Morristown Water Co.	1966	124	496	420	Trb
25-14-444	City of Morristown			-	0	"
25-14-453	Allied Chemical Corp.	1969	185/203	253	329	Q
25-14-464	Morris Co. Golf Club			306	72	"
25-14-466	"			306	72	"
25-14-473	Moore, P.			270	70	Trb
25-14-496	Parsippany-Troy Hills Twp. Water Dept.	1973	80-100	107	602	Qtm
25-14-511	City of Morristown			99	0	Q
25-14-514	Blanchard Securities Inc.	1954	114'3"	134	220	"
25-14-514	"	1954	111	133	350	"
25-14-517	Farmer's & Consumer's Dairy			118	114	"
25-14-531	City of Morristown			124	1016	"
25-14-532	Driver, Wilbur, Co.	1962	107	107	1350	"
25-14-532	U.S.Geological Survey	1966	99	108	329	"
25-14-536	"	1965	53	61	-	"
25-14-545	College of St.Elizabeth			590	90	Trb
25-14-563	Boro of Florham Park	1952	100/110	120	210	Q
25-14-563	Burden			119	222	"
25-14-563	Boro of Florham Park	1941	68/80	81	440	"
25-14-565	"	1928	47/65	100	187	"
25-14-566	"	1928	7/75	75	400	"
25-14-572	Twombly, A.M.K.			487	165	Q-Trb
25-14-573	Esso Research & Eng.Co.	1967	78	88	100	Q
25-14-575	Twombly, A.M.K.			300	160	Q-Trb
25-14-587	Boro of Madison	1955	124	160	1353	Q
25-14-629	Boro of Florham Park	1968	55/65	135	310	"
25-14-629	Automatic Switch Co.			272	170	Trb
25-14-639	Allied Chemical Corp.	1960	154'9"	175	310	Q
25-14-641	Boro of Florham Park	1964	67/103	103	735	"
25-14-641	"	1964	89/100	100.6	108	"
25-14-644	U.S.Geological Survey			85	-	Q-Trb
25-14-664	Boro of Florham Park	1952	82/89	128	80	Q
25-14-664	Florham Park	1968	-	78	0	Trb
25-14-666	U.S.Geological Survey	1967		55	-	Q-Trb
25-14-682	"			125	205	Q
25-14-698	City of East Orange	1958	93'4"	130	1080	Q
25-14-698	East Orange Bd.of Water Comm.	1974	85-123	130	1000	Qsd
25-14-724	City of Morristown	1959		18	0	Trbs
25-14-744	Heald, O.A.			516	22	Trb
25-14-814	Dodge, H.			95	175	Q
25-14-817	Boro of Madison			249	No Test	"
25-14-817	"			289	"	Q-Trb
25-14-822	"	1956	124	181	1248	Q
25-14-836	"	1966	107	250	30	Trb
25-14-847	Madison Golf Club	1966	266	420	157	"
25-14-886	Judge Lathrop			165	0	"
25-14-887	Commonwealth Water Co.			150	-	"
25-14-932	City of East Orange	1958	81	124	1080	"
25-14-933	"			214	120	"
25-14-933	"			158	100	"
25-14-933	"			295	94	"
25-14-935	"	1958	84'9"	130	1000	"
25-14-935	"	1958	86'10"	120	1000	"
25-14-936	"			133	1000	"

25-14-944	Boro of Madison			130	824	Trb
25-14-944	"	1967	159	178	310	"
25-14-944	"			130	622	Q
25-14-944	"			131	650	"
25-14-944	"			140	580	"
25-14-949	Boro of Chatham			162	-	"
25-14-949	Ruzicka Greenhouse			123	204	"
25-14-949	Boro of Chatham			143	1200	"
25-14-949	"	1956	94	150	1200	"
25-14-949	"			143	700	"
25-14-951	U.S.Geological Survey	1966	63	90	95	"
25-14-959	Commonwealth Water Co.			124	-	"
25-14-967	Minisink Golf Club	1955	122	210	200	Trb
25-14-983	U.S.Geological Survey	1967	142	197	201	Q
25-14-992	Commonwealth Water Co.	1955	88	119	1018	"
25-14-995	"	1955	102'6"	149	1240	"
25-14-998	"			94	-	"
25-15-115	Oldham, Kenneth	1954	63	63	75	"
25-15-144	Valley Concrete			350	100	Trb
25-15-153	Fritsche Bros.	1969	136	533	455	"
25-15-155	Hanover Greens Water Co.	1960	139'1"	270	70	"
25-15-158	Twp. of Livingston	1960	-	101	-	Q
25-15-159	"	1955		122	-	"
25-15-165	Fritsche Bros.	1968	121'6"	643	164	Trb
25-15-167	Twp. of Livingston	1955		129	-	Q
25-15-176	Valley View Golf Club	1965		300	130	Trb
25-15-183	Twp. of Livingston	1955	43	83	700	Q
25-15-187	G.V. Controls	1958	83/98	300	165	Trb
25-15-412	Twp. of Livingston	1965		63	-	Q
25-15-413	Chatham Electronics Corp.			301	365	Trb
25-15-413	Twp. of Livingston			204	175	"
25-15-416	"	1965	68	75	-	"
25-15-422	Daven Co.	1955	175	450	55	Q-Trb
25-15-422	"			190	5	"
25-15-423	"	1955	29'7"	33	100	Trb
25-15-423	"	1955	43'6"	60	212	"
25-15-425	Twp. of Livingston	1964	114/177	181	-	"
25-15-426	"	1964	161'9"/124'8"	176	-	"
25-15-433	"	1964	123	140	-	"
25-15-434	"	1965	74'8"	132	160	Q
25-15-434	"			76	300	"
25-15-437	Sandoz Pharmaceutical	1966	91'6"	101	289	"
25-15-451	Twp. of Livingston	1965	126	136	-	"
25-15-452	"	1966	63'1"	118	40	"
25-15-453	"			99	-	"
25-15-462	"			161	87	Trb
25-15-489	Leemac Construction Co.			284	125	"
25-15-726	East Orange Water Dept.			190	300	"
25-15-727	"			200	300	"
25-15-729	"			180	300	"
25-15-742	Orange Products Co.	1965	106	135	602	Q

25-15-745	Commonwealth Water Co.	1954		116	-	Q
25-15-748	"			150	328	"
25-15-765	East Orange Water Dept.			125	1400	"
25-15-766	"	1958	80'1-1/2"	128	760	"
25-15-767	"			130	0	"
25-15-768	"			130	1400	"
25-15-773	Commonwealth Water Co.			166	-	"
25-15-776	"			165	-	"
25-15-776	"			133	-	"
25-15-781	"			158	200	"
25-15-782	"	1954	115"9"	162	850	"
25-15-783	"			90	1580	"
25-15-793	"			190	-	Q-Trb
25-15-797	"			283	0	"

J. Geodetic Control Survey monuments described
Index Maps 20,25

SUBJECT TO REVISION

WATER WITHDRAWAL POINTS AND NJGS CASE INDEX SITES WITHIN 5.0 MILES OF:

LATITUDE 404844
LONGITUDE 742251

DRAFT

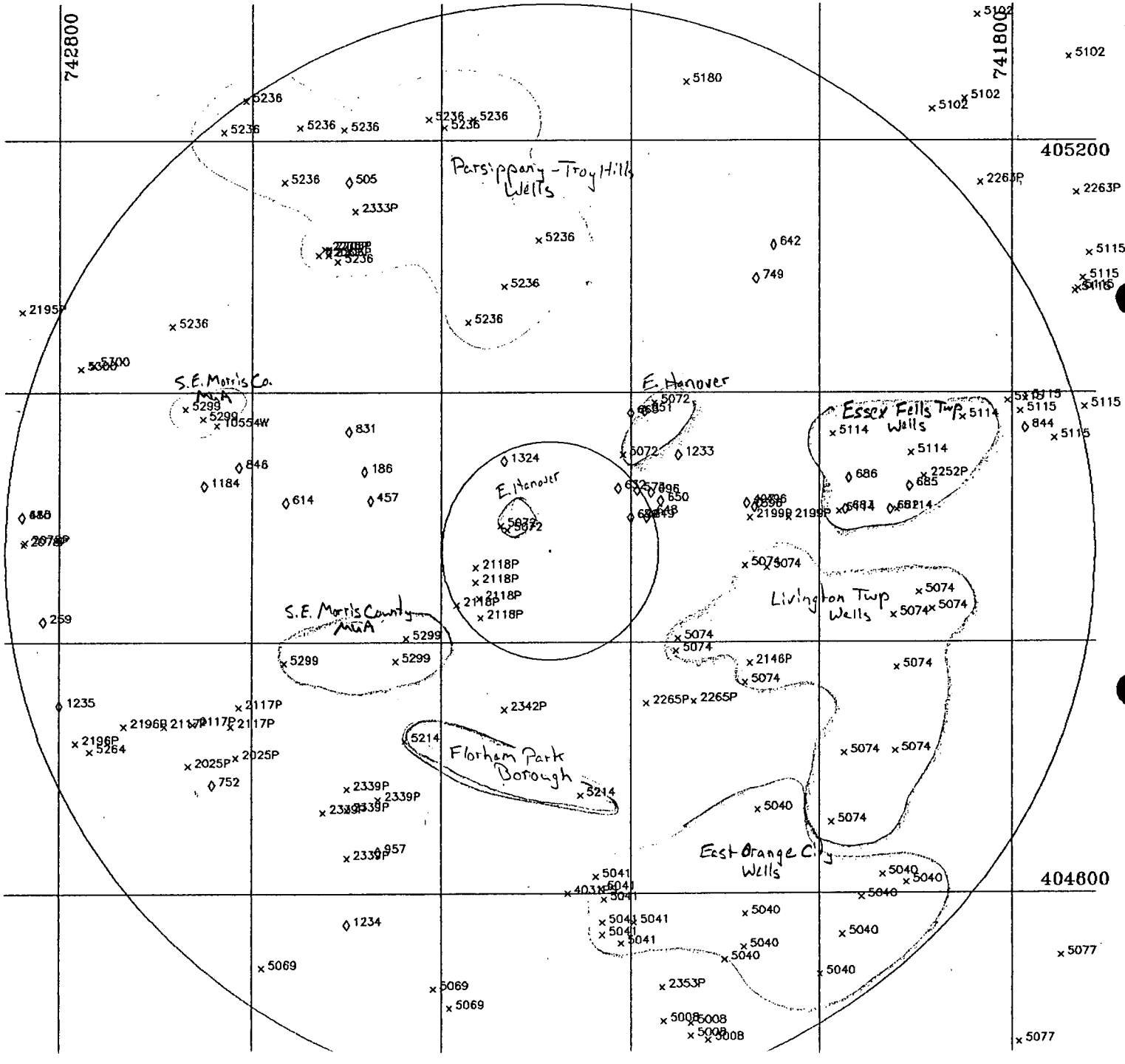
SCALE: 1:63,360
(1 Inch = 1 Mile)

× WATER WITHDRAWAL POINTS
◊ NJGS CASE INDEX SITES
1 MILE AND 5 MILE RADII INDICATED

NJGS CASE INDEX DATA RETRIEVED FROM:
NEW JERSEY GEOLOGICAL SURVEY
ON 12/22/87

PLOT PRODUCED BY:
NJDEP
DIVISION OF WATER RESOURCES
BUREAU OF WATER ALLOCATION
CN-029
TRENTON, NJ 08625

DATE: 03/07/89



NUMBER	NAME	SOURCEID	LOCID	LAT	LON	LLACC	DISTANCE	COUNTY	MUN	DEPTH	GEO1	GEO2	CAPACITY
2195P	WARNER LAMBERT COMPANY	2504274	6	405038	742823		5.3	27	23	102	GOSD		500
2078P	MENNEN COMPANY	2501891	1	404847	742822	F	4.8	27	22	85	GOTM		200
2078P	MENNEN COMPANY	2513682	2	404848	742821	F	4.8	27	22	100	GOTM		200
2196P	MORRISTOWN MEMORIAL HOSPITAL	2508577	2	404712	742750		4.7	27	24	507	GTRB		300
5300	SOUTHEAST MORRIS COUNTY MUA	4500317	WELL #2	405011	742747	F	4.6	27	12	60	GOSD		350
5264	SOUTHEAST MORRIS COUNTY MUA	2513439	TURNBULL	404708	742741		4.6	27	24	492	GTRB		450
5300	SOUTHEAST MORRIS COUNTY MUA	4500316	WELL #1	405013	742739	F	4.5	27	29	60	GOSD		400
2196P	MORRISTOWN MEMORIAL HOSPITAL	2505647	1	404720	742720		4.2	27	24	504	GTRB		300
2117P	ALLIED CORPORATION	2515313	4	404720	742655		3.9	27	22	203	GOSD		420
5236	PARSIPPANY-TROY HILLS	2513259	14	405031	742650	F	4.0	27	29	90	GOSD		700
5236	PARSIPPANY-TROY HILLS	2515809	15	405031	742650	F	4.0	27	29	87	GOSD		150
5299	SOUTHEAST MORRIS COUNTY MUA	2500048	WING	404952	742642	F	3.6	27	12	138	GOSD		2500
2025P	MORRIS COUNTY GOLF CLUB	2516215	2	404701	742640		3.9	27	24	238	GOSD		15
2117P	ALLIED CORPORATION	2504286	1	404721	742637		3.7	27	22	767	GTRB		100
5299	SOUTHEAST MORRIS COUNTY MUA	25003527	TODD	404947	742631	F	3.4	27	12	144	GOSD		1000
10554W	NEW JERSEY BELL TELEPHONE	2513372	1	404944	742622	F	3.3	27	12	198	GOSD		120
5236	PARSIPPANY-TROY HILLS	2511628	10	405204	742618	F	4.9	27	29	129	GOSD		500
2117P	ALLIED CORPORATION	2522302	10	404720	742613		3.4	27	22	195	GOSD		300
2025P	MORRIS COUNTY GOLF CLUB	2510487	1	404705	742610	F	3.5	27	24	271	GOSD		150
2117P	ALLIED CORPORATION	2509253	2	404729	742608		3.2	27	22	172	GOSD		410
5236	PARSIPPANY-TROY HILLS	2518850	18	405219	742604	F	5.0	27	29	127	GOSD		750
5069	MADISON BOROUGH	2504209	C	404524	742554		4.7	27	17	160	GOSD		1200
5236	PARSIPPANY-TROY HILLS	2512718	12	405140	742540	F	4.2	27	29	100	GOSD		300
5299	SOUTHEAST MORRIS COUNTY MUA	4500351	NORMANDY	404750	742540		2.7	27	12	80	GOSD		400
5236	PARSIPPANY-TROY HILLS	2507381	1A	405206	742530	F	4.5	27	29	138	GOSD		420
2206P	PFIZER, INC.-CONSUMER PRODUCTS	2511876	3	405105	742518	F	3.4	27	29	85	GOSD		450
2339P	EXXON RESEARCH & ENGINEERING	2514658	2	404639	742515		3.2	27	11	88	GOTM		24
2206P	PFIZER, INC.-CONSUMER PRODUCTS	4500256	4	405108	742514	F	3.5	27	29	85	GOSD		450
2206P	PFIZER, INC.-CONSUMER PRODUCTS	2506488	1	405105	742512	F	3.4	27	29	95	GOSD		275
2206P	PFIZER, INC.-CONSUMER PRODUCTS	2514192	5 RECHARGE	405108	742512	F	3.4	27	29	80	GOSD		450
2306P	FAIRMOUNT COUNTRY CLUB	4500084	1	404425	742510		5.4	27	04	390	GTRB		325
5236	PARSIPPANY-TROY HILLS	2507620	7	405102	742506	F	3.3	27	29	66	GOSD		500
5236	PARSIPPANY-TROY HILLS	4500033	4	405205	742502	F	4.3	27	29	82	GOSD		225
5236	PARSIPPANY-TROY HILLS	2507545	4A	405205	742502	F	4.3	27	29	150	GOSD		900
2339P	EXXON RESEARCH & ENGINEERING	2500067	1	404650	742500		2.9	27	11	100	GOTM		1030
2339P	EXXON RESEARCH & ENGINEERING	2506994	1	404617	742500		3.4	27	11	100	GOTM		1030
2339P	EXXON RESEARCH & ENGINEERING	4500326	4	404640	742500	U	3.0	27	11		GOTM		
2333P	BOONTON ELECTRONICS	2525494	5	405126	742455	F	3.6	27	29	78	GTRB		200
2339P	EXXON RESEARCH & ENGINEERING	2515953	3	404645	742440		2.8	27	11	120	GOTM		
5299	SOUTHEAST MORRIS COUNTY MUA	2514181	BLCK BRK 1	404751	742429		1.8	27	12	124	GOSD		1400
5214	FLORHAM PARK BOROUGH	4500299	2	404713	742423	S	2.2	27	11	105	GOSD		1000
5214	FLORHAM PARK BOROUGH	2521204	4	404713	742423	S	2.2	27	11	139	GOSD		1300
5299	SOUTHEAST MORRIS COUNTY MUA	2514482	BLCK BRK 2	404802	742422		1.6	27	12	122	GOSD		1400
5236	PARSIPPANY-TROY HILLS	2511627	9	405210	742408	F	4.1	27	29	80	GOSD		540
5069	MADISON BOROUGH	2504423	D	404514	742405		4.2	27	17	181	GOSD		1000
5236	PARSIPPANY-TROY HILLS	4500032	3	405206	742358	F	4.0	27	29	75	GOSD		350
5069	MADISON BOROUGH	2501962	A	404505	742355		4.3	27	17	130	GOSD		750
5069	MADISON BOROUGH	2504207	B	404505	742355		4.3	27	17	143	GOSD		1200
5069	MADISON BOROUGH	2514041	E-STANDBY	404505	742355		4.3	27	17	140	GOSD		1500
2118P	SANDOZ INC.	2513935	5	404818	742350		1.0	27	10	132	GOSD		500
5236	PARSIPPANY-TROY HILLS	4500034	8-1	405033	742343	F	2.2	27	29	90	GOSD		300
5236	PARSIPPANY-TROY HILLS	4500035	8-2	405033	742343	F	2.2	27	29	80	GOSD		400
5236	PARSIPPANY-TROY HILLS	4500036	8-3	405033	742343	F	2.2	27	29	80	GOSD		600
5236	PARSIPPANY-TROY HILLS	2518849	17	405210	742340	F	4.0	27	29	139	GOSD		700
2118P	SANDOZ INC.	4500044	1	404836	742338		0.7	27	10	49	GOSD		500
2118P	SANDOZ INC.	4500045	2	404809	742338		0.7	27	10	58	GOSD		500

NUMBER	NAME	SOURCEID	LOCID	LAT	LON	LLACC	DISTANCE	COUNTY	MUN	DEPTH	GEO1	GEO2	CAPACITY
2118P	SANDOZ INC.	2500635	3	404821	742336		0.8	27	10	81	GOSD		500
2118P	SANDOZ INC.	2513934	4	404812	742335		0.9	27	10	84	GOSD		500
5046	CHATHAM BOROUGH	4500270	1	404439	742323		4.7	27	05	143	GOSD		1050
5046	CHATHAM BOROUGH	4500271	2	404439	742323		4.7	27	05	140	GOSD		560
5046	CHATHAM BOROUGH	2505687	3	404439	742323		4.7	27	05	150	GOSD		1200
5072	EAST HANOVER TOWNSHIP	2514205	2	404856	742322	F	0.5	27	10	115	GOSD		1000
2342P	MORRIS COUNTY PARK COMMISSION	45000355	WELL	404728	742320	F	1.5	27	11	250	GTRB		313
2342P	MORRIS COUNTY PARK COMMISSION		POND	404728	742320	F	1.5	27	11	14			1100
5236	PARSIPPANY-TROY HILLS	2512635	11	405050	742320		2.4	27	29	80	GOSD		70
5072	EAST HANOVER TOWNSHIP	2513672	1	404854	742318	F	0.4	27	10	130	GOSD		500
5236	PARSIPPANY-TROY HILLS	2511106	13	405112	742258	F	2.8	27	29	47	GOSD		425
4031FS	BROOKLAKE COUNTRY CLUB	POND	1	404600	742240		3.1	27	11		SP		
5214	FLORHAM PARK BOROUGH	2512424	3	404647	742232	F	2.3	27	11	103	GOSD		900
5041	EAST ORANGE CITY	2507096	BRDBRN 3	404608	742222	S	3.0	27	11	115	GTRB		1000
5041	EAST ORANGE CITY	2517364	BRDBRN 4	404608	742222	S	3.0	27	11	122	GTRB		1000
5041	EAST ORANGE CITY	2507097	BRDBRN 2	404602	742219	S	3.1	27	11	124	GTRB		1000
5041	EAST ORANGE CITY	2507099	DONSN 1	404546	742218	S	3.4	13	10	125	GTRB		1000
5041	EAST ORANGE CITY	2507100	DONSN 2	404540	742218	S	3.6	13	10	114	GTRB		1000
5041	EAST ORANGE CITY	2507098	BRDBRN 1	404557	742217	S	3.2	27	11	120	GTRB		1000
5008	NEW JERSEY-AMERICAN WATER CO.	2504872	WELL #50	404427	742212		4.9	13	12	118	GOSD		
5008	NEW JERSEY-AMERICAN WATER CO.	2504873	WELL #51	404430	742212		4.9	13	12	121	GOSD		750
5041	EAST ORANGE CITY	2507101	DONSN 3	404536	742206	S	3.7	13	10	130	GTRB		1000
5072	EAST HANOVER TOWNSHIP	2525792	6	404930	742205	F	4.1	27	10	110	GOSD		1000
5041	EAST ORANGE CITY	2524573	DONSN 4	404546	742158	S	3.5	13	03	140	GTRB		350
2265P	CEDAR HILL COUNTRY CLUB	POND		404731	742150	T	1.7	13	10	8	GTRB		510
5072	EAST HANOVER TOWNSHIP	2518267	5	404955	742145	F	1.7	27	10	120	GOSD		900
2353P	ORANGE PRODUCTS, INC.	2512852	1	404515	742140	F	4.1	27	11	135	GOSD		600
5008	NEW JERSEY-AMERICAN WATER CO.	4500259	CONTINENTA	404459	742139		4.4	13	12	105	GOSD		95
5074	LIVINGSTON TOWNSHIP	2512755	7	404756	742131	S	1.5	13	10	301	GTRB		300
5074	LIVINGSTON TOWNSHIP	2516551	9	404902	742130	S	1.4	13	10	300	GTRB		300
5180	MONTVILLE TOWNSHIP MUA	2503687	2	405228	742125	F	4.5	27	21	290	GTRBS		125
5008	NEW JERSEY-AMERICAN WATER CO.	4500257	WELL #38	404452	742122		4.6	13	12	309	GOSD		450
5008	NEW JERSEY-AMERICAN WATER CO.	4500262	WELL K-4	404458	742122		4.5	13	12	129	GOSD		700
2265P	CEDAR HILL COUNTRY CLUB	4500308	1	404732	742120	T	1.9	13	10	210	GTRB		80
2265P	CEDAR HILL COUNTRY CLUB	4500309	2	404732	742120	T	1.9	13	10	190	GTRB		125
5008	NEW JERSEY-AMERICAN WATER CO.	2501994	WELL K-6	404431	742115		5.0	13	12	144	GOSD		700
5008	NEW JERSEY-AMERICAN WATER CO.	4500264	WELL LE	404439	742114		4.9	13	12	129	GOSD		
5008	NEW JERSEY-AMERICAN WATER CO.	4500258	WELL LD	404438	742111		4.9	13	12	129	GOSD		500
5008	NEW JERSEY-AMERICAN WATER CO.		WELL #46	404432	742111		5.0	13	12	123	GOSD		500
5008	NEW JERSEY-AMERICAN WATER CO.	4500263	WELL K-5	404450	742111		4.7	13	12	131	GOSD		500
5008	NEW JERSEY-AMERICAN WATER CO.	2504100	WELL #48	404432	742105		5.1	13	12	137	GOSD		700
5040	EAST ORANGE CITY	4500006	SLOUGH B 1	404528	742101	S	4.1	13	12	257	GTRB		175
5008	NEW JERSEY-AMERICAN WATER CO.	4500261	WELL K-2	404440	742100		4.9	13	12	134	GOSD		950
5008	NEW JERSEY-AMERICAN WATER CO.	2504019	WELL #47	404435	742058		5.0	13	12	162	GOSD		250
5008	NEW JERSEY-AMERICAN WATER CO.	2502577	WELL #44	404437	742049		5.0	13	12	153	GOSD		250
5040	EAST ORANGE CITY	4500007	SLOUGH B 2	404534	742049	S	4.0	13	10	360	GTRB		250
5040	EAST ORANGE CITY	2519136	SLOUGH B 4	404550	742048	S	3.8	13	10	285	GTRB		300
5074	LIVINGSTON TOWNSHIP	4500341	5	404837	742048	S	1.8	13	10	90	GOSD		1000
5074	LIVINGSTON TOWNSHIP	2513589	6	404741	742048	S	2.2	13	10	100	GOSD		380
2146P	INDUSTRIAL ELECTRICAL PRODUCTS	2504151	1	404750	742045		2.1	13	10	450	GTRB		240
2199P	FRITZSCH - D & O	2514996	2	404900	742045		1.9	27	10	533	GTRB		455
5040	EAST ORANGE CITY	4500008	SLOUGH B 3	404640	742040	S	3.0	13	10	176	GTRB		300
5074	LIVINGSTON TOWNSHIP	2504600	3	404836	742034	S	2.0	13	10	83	GOSD		1500
2199P	FRITZSCH - D & O	2514708	1	404900	742020		2.2	27	10	643	GTRB		170
5008	NEW JERSEY-AMERICAN WATER CO.	4500260	K-1	404427	742015		5.4	13	12	136	GOSD		700

NUMBER	NAME	SOURCEID	LOCID	LAT	LON	LLACC	DISTANCE	COUNTY	MUN	DEPTH	GEO1	GEO2	CAPACITY
5040	EAST ORANGE CITY	2601712	CANOE BR 2	404521	742000	S	4.6	13	12	116	GTRB		750
5074	LIVINGSTON TOWNSHIP	2520463	12	404634	741953	S	3.6	13	10	457	GTRB		300
5114	ESSEX FELLS TOWNSHIP	2600454	10	404940	741952	F	2.8	13	18	194	GTRB		500
5114	ESSEX FELLS TOWNSHIP	2600829	12	404903	741948	S	2.7	13	18	220	GTRB		325
5040	EAST ORANGE CITY	2601713	CANOE BR 3	404540	741946	S	4.4	13	10	110	GTRB		750
5074	LIVINGSTON TOWNSHIP	2516303	10	404707	741945	S	3.3	13	10	456	GTRB		300
5040	EAST ORANGE CITY	2601714	CANOE BR 4	404558	741934	S	4.3	13	10	102	GTRB		750
5040	EAST ORANGE CITY	2604476	CANOE BR 5	404609	741921	S	4.3	13	10	320	GTRB		500
5074	LIVINGSTON TOWNSHIP	4500340	1	404813	741914	S	3.2	13	10	372	GTRB		200
5074	LIVINGSTON TOWNSHIP	2601240	4	404708	741913	S	3.7	13	10	291	GTRB		400
5074	LIVINGSTON TOWNSHIP	4500343	11	404748	741912	S	3.4	13	10	400	GTRB		400
5114	ESSEX FELLS TOWNSHIP	2600830	11	404904	741912	S	3.2	13	18	250	GTRB		175
5040	EAST ORANGE CITY	2604486	CANOE BR 6	404605	741906	S	4.5	13	12	175	GTRB		200
5114	ESSEX FELLS TOWNSHIP	2602647	15	404931	741903	S	3.4	13	18	468	GTRB		500
5114	ESSEX FELLS TOWNSHIP	2602736	16	404931	741903	S	3.4	13	18	465	GTRB		500
5074	LIVINGSTON TOWNSHIP	4500342	8	404824	741858	S	3.4	13	10	410	GTRB		300
2252P	WOODLAND WEST ASSOC.	2604122	1	404920	741855	T	3.5	13	18	305	GTRBS		125
5074	LIVINGSTON TOWNSHIP	2601095	2	404816	741850	S	3.6	13	10	384	GTRB		200
5102	FAIRFIELD TOWNSHIP	2603047	4	405215	741850		5.4	13	07	101	GQSD		175
5114	ESSEX FELLS TOWNSHIP	2604743	17	404948	741831	S	4.0	13	18	450	GTRB		500
5102	FAIRFIELD TOWNSHIP	2604731	9	405220	741830		5.6	13	07	95	GQSD		125
5102	FAIRFIELD TOWNSHIP	2602939	1	405300	741822		6.3	13	07	90	GQSD		300
2263P	MOUNTAIN RIDGE COUNTRY CLUB	2602683	2	405140	741820	F	5.2	13	07	275	GTRB		200
5077	ORANGE CITY	4600169	2	404424	741810	S	6.4	13	12	113	GQSD		1000
5077	ORANGE CITY	4600170	3	404435	741805	F	6.3	13	12	76	GQSD		1400
5115	ESSEX FELLS TOWNSHIP	4600205	8	404956	741803	S	4.4	13	06	420	GTRB		350
5077	ORANGE CITY	4600171	4	404449	741756	S	6.2	13	12	94	GQSD		1380
5115	ESSEX FELLS TOWNSHIP	4600204	7	404951	741755	S	4.5	13	06	95	GQSD		400
5115	ESSEX FELLS TOWNSHIP	4600206	9	404957	741752	S	4.6	13	06	364	GTRB		400
5115	ESSEX FELLS TOWNSHIP	2601910	14	404957	741752	S	4.6	13	06	92	GQSD		400
5115	ESSEX FELLS TOWNSHIP	4600203	6	404938	741734	S	4.7	13	06	565	GTRB		300
5077	ORANGE CITY	2603701	6	404530	741730	S	6.0	13	22	132	GQSD		1400
5102	FAIRFIELD TOWNSHIP	2602940	2	405240	741725		6.6	13	07	279	GTRB		200
5115	ESSEX FELLS TOWNSHIP	4600207	4A	405048	741721	S	5.4	13	21	195	GTRB		300
2263P	MOUNTAIN RIDGE COUNTRY CLUB	4600166	1	405135	741720	F	5.8	13	21	240	GTRB		300
5115	ESSEX FELLS TOWNSHIP	4600208	4B	405049	741719	S	5.4	13	21	270	GTRB		200
5115	ESSEX FELLS TOWNSHIP	4600209	4C	405054	741716	S	5.5	13	21	360	GTRB		120
5115	ESSEX FELLS TOWNSHIP	4600200	1A	404953	741715	S	5.1	13	06	96	GQSD		300
5115	ESSEX FELLS TOWNSHIP	2601640	13	405106	741712	S	5.6	13	21	254	GTRB		200

Number of Observations: 151

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
32 E. Hanover St., CN 028, Trenton, N.J. 08625

DR. MARWAN M. SADAT, P.E.
DIRECTOR

LINO F. PEREIRA, P.E.
DEPUTY DIRECTOR

IN THE MATTER OF	:	ADMINISTRATIVE
Norda, Incorporated	:	CONSENT ORDER

The following FINDINGS are made and ORDER is issued pursuant to the authority vested in the Commissioner of the New Jersey Department of Environmental Protection (hereinafter "NJDEP") by the Environmental Cleanup Responsibility Act, N.J.S.A. 13:1K-6 et seq., and duly delegated to the Assistant Director for Enforcement and Field Operations within the Division of Waste Management pursuant to N.J.S.A. 13:1B-4.

FINDINGS

1. The Environmental Cleanup Responsibility Act, N.J.S.A. 13:1K-6 et seq. ("ECRA" or "the Act"), was signed into New Jersey State Law by Governor Thomas H. Kean on September 2, 1983, and took effect on December 31, 1983.

2. ECRA required the NJDEP to adopt rules and regulations to implement the Act. On March 6, 1984, NJDEP adopted the Interim ECRA Regulations, N.J.A.C. 7:1-3 ("Regulations") in compliance with the Administrative Procedures Act, N.J.S.A. 52:14B-1 et seq., upon acceptance for filing by the Office of Administrative Law pursuant to N.J.A.C. 1:30-4.4(d).

3. ECRA requires that the owner or operator of an industrial establishment planning to sell or transfer operations (a) notify the NJDEP in writing within five days of the execution of an agreement of sale pursuant to N.J.A.C. 7:1-3.7, (b) submit within 60 days prior to transfer of title a negative declaration or cleanup plan to the NJDEP for approval, and (c) obtain, upon approval of any necessary cleanup plan by the NJDEP, a surety bond or other financial security approved by the NJDEP guaranteeing performance of the cleanup plan in an amount equal to the cost estimate for the approved cleanup plan.

4. N.J.S.A. 13:1K-13 provides that failure to submit a negative declaration or cleanup plan pursuant to ECRA is grounds for voiding the sale by NJDEP. Any person who knowingly gives or causes to be given any false

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information or who fails to comply with the provisions of ECRA is liable for a penalty of not more than $25,000.00 for each occurrence, and each day of a violation of a continuing nature constitutes an additional and separate offense. Furthermore, any officer or management official of an industrial establishment who knowingly directs or authorizes the violation of any provisions of the Act shall be personally liable for the $25,000.00 penalties for each violation described above.

5. Norda Incorporated (Norda) owns and operates a manufacturing facility located at 140 Route 10, East Hanover, Morris County; further known as Block 96, Lots 81, 82, and 99.3 on the Tax Assessment Map of the Township of East Hanover (East Hanover facility). At said East Hanover facility, Norda blends and manufactures products for the flavors and fragrance industry, operations having Standard Industrial Classification (SIC) numbers 2087, 2844, 2869, and 2899. The East Hanover facility is an Industrial Establishment as defined by ECRA.

6. On September 27, 1984, Norda executed an agreement for sale of the East Hanover facility and its interest in other facilities located in England, Brazil, Canada, and Mexico to Unilever United States, Incorporated (Unilever). Said agreement was ratified and became effective on October 3, 1984. On October 9, 1984, Norda submitted the first portion of its Initial ECRA Notice the General Information Submission (see N.J.A.C. 7:1-3.7(d)1-8), to NJDEP. Thereafter, on November 13, 1984, Norda submitted the second part of the Initial ECRA Notice, the Site Evaluation Submission (see N.J.A.C. 7:1-3.7(d)9-17), to NJDEP. Upon receipt, NJDEP promptly reviewed each portion of Norda's Initial ECRA Notice. NJDEP found Norda's Site Evaluation Submission to be incomplete, and sent Norda a checklist detailing the additional information required on November 19, 1984. NJDEP has not yet approved Norda's Site Evaluation Submission.

7. On December 4, 1984, NJDEP conducted a preliminary site inspection of Norda's East Hanover facility. On December 18, 1984, NJDEP sent Norda a Preliminary Inspection Report which detailed the findings of the inspection and the resultant requirements on the part of Norda.

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8. On December 10, 1984, Norda submitted to NJDEP a report entitled "Geohydrologic Investigation and Consultation, Norda Inc. Manufacturing Facility, East Hanover, New Jersey". The report, prepared by Dames and Moore, details findings from preliminary investigation at the East Hanover facility, proposes cleanup activities, and provides cost estimates for cleanup activities proposed. Norda intends to provide NJDEP with a Sampling Plan and a final Cleanup Plan as required by ECRA.

9. The submission and implementation of a cleanup plan pursuant to ECRA may be necessary and required for the East Hanover facility because hazardous substances have been, and continue to be, used on-site and hazardous waste may be generated at the site in the future.

10. Norda is presently under contractual obligation to conclude the sale of the East Hanover facility to Unilever by the third week of December, 1984. Norda has advised NJDEP that both Norda and Unilever have already made substantial arrangements in contemplation of the impending sale. Therefore, Norda desires to enter into an Administrative Consent Order with NJDEP which will permit the proposed sale to be completed prior to completion of all ECRA requirements. Norda understands and accepts its responsibilities and liabilities under ECRA.

11. In appropriate cases, NJDEP may allow transactions subject to ECRA to proceed prior to completing the standard ECRA administrative process by execution of an Administrative Consent Order. These Administrative Consent Orders establish a time schedule for completion of ECRA requirements by the industrial establishment and provide for financial assurances in a form and amount acceptable to NJDEP prior to consummation of any transactions subject to ECRA. Failure to fully comply with all the terms and conditions of the Administrative Consent Order shall subject Norda to the full range of penalties and remedies prescribed in the Act, the Regulations, and the Administrative Consent Order.

NOW, THEREFORE, IT IS ORDERED AND AGREED THAT:

12. ECRA Program Requirements

A. Norda shall initiate, complete, and submit to NJDEP the results from any NJDEP-approved sampling plan pursuant to N.J.A.C. 7:1-3.7(d)14 and N.J.A.C. 7:1-3.9 within 90 days from receipt of NJDEP's written approval of the sampling plan.

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B. Norda shall submit a Negative Declaration or Cleanup Plan as required by N.J.A.C. 7:1-3.10 within 120 days from receipt of NJDEP's written approval of the sampling plan.

C. Norda shall implement any NJDEP approved Cleanup Plan in accordance with the approved time schedule or defer implementation of all or part of the Cleanup Plan subject to NJDEP approval pursuant to N.J.A.C. 7:1-3.14.

D. Should NJDEP determine that any submittal made under this section is inadequate or incomplete then NJDEP shall provide Norda with written notification of the deficiency(ies), and Norda shall revise and resubmit the required information within a reasonable period of time not to exceed thirty (30) days from receipt of such notification.

13. Financial Assurance

A. Norda shall obtain and provide to NJDEP financial assurance in the form of a surety bond, letter of credit, or other instrument acceptable to NJDEP in the amount of $1,500,000 within fourteen days from the execution of this Administrative Consent Order. The financial assurance must conform with the requirements of N.J.S.A. 13:1K-9(b)3, N.J.A.C. 7:1-3.10, N.J.A.C. 7:1-3.13, and this Administrative Consent Order.

B. Norda shall establish a standby trust fund within fourteen days from the effective date of this Administrative Consent Order. The financial institution which issues the financial assurance shall agree to promptly and directly deposit all amounts up to the total value of the financial assurance into the standby trust fund upon demand by NJDEP.

C. Upon NJDEP approval of a Cleanup Plan, Norda shall amend the amount of the financial assurance to equal the estimated cost of implementation of the approved Cleanup Plan, or shall provide such other financial assurance as may be approved by NJDEP in an amount equal to the estimated cost of implementation of the approved Cleanup Plan.

D. In the event that NJDEP determines that Norda has failed to perform any of its obligations under this Administrative Consent Order, NJDEP may draw on the financial assurance; provided, however, that before

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any such demand is made, NJDEP shall notify Norda in writing of the obligation(s) with which it has not complied, and Norda shall have reasonable time, not to exceed fourteen calendar days, to perform such obligation(s) to NJDEP's satisfaction. Nothing in this paragraph shall prevent NJDEP from collecting stipulated penalties pursuant the terms of this Administrative Consent Order.

14. Additional Conditions of Consent

A. Norda and Unilever shall allow the NJDEP access to the subject industrial establishment for the purpose of undertaking all necessary monitoring and environmental cleanup activities. Prior to entry into this Administrative Consent Order, Norda shall provide NJDEP with appropriate documentation that Unilever shall allow NJDEP the access required herein.

B. NJDEP agrees that it will not bring any action, nor will it recommend that the Attorney General's Office bring any action for failure to comply with (a) the time requirements in N.J.S.A. 13:1K-9(b)1 that NJDEP be notified within five (5) days of execution of agreement of sale or option to purchase or (b) the time requirement in N.J.S.A. 13:1K-9(b)2 that a negative declaration or cleanup plan be submitted 60 days prior to transfer of title. NJDEP also agrees that it will not bring any action, nor will it recommend that the Attorney General bring any action seeking monetary penalties for Norda's failure to meet the time requirements specified in (a) and (b) of this paragraph.

C. No obligations imposed by this Administrative Consent Order (other than paragraph D below) are intended to constitute a debt, claim, penalty or other civil action which could be limited or discharged in a bankruptcy proceeding. All obligations imposed by this Administrative Consent Order shall constitute continuing regulatory obligations imposed pursuant to the police power of the State of New Jersey, intended to protect the public health, safety and welfare.

D. In the event that Norda fails to comply with any of the provisions of this Administrative Consent Order, Norda shall pay to NJDEP stipulated penalties in the amount of $5,000.00 for each day on which Norda fails to comply with any obligation under this Administrative Consent Order; provided,

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however, that no such stipulated penalty shall be payable by Norda with respect to such period that said failure to comply results from Force Majeure.

E. The provisions of this Administrative Consent Order shall be binding upon Norda and its officers, directors, successors in interest, and any trustee in bankruptcy or receiver appointed pursuant to a proceeding in law or equity.

F. Norda's failure to comply with any of its obligations under this Administrative Consent Order shall constitute grounds for the NJDEP to void the subject sale or transfer.

15. Force Majeure

If any event occurs which purportedly causes or may cause delays in the achievement of any deadline contained in this Administrative Consent Order, Norda shall notify NJDEP in writing within ten (10) days of the delay or anticipated delay, as appropriate, referencing this paragraph and describing the anticipated length, precise cause or causes, measures taken or to be taken and the time required to minimize the delay. Norda shall adopt all necessary measures to prevent or minimize any delay. If any delay or anticipated delay had been or will be caused by fire, flood, riot, strike or other circumstances alleged to be beyond the control of Norda, then the time for performance hereunder may be extended by NJDEP for a period no longer than the delay resulting from such circumstances, ~~or 15 days, whichever is shorter;~~ provided that NJDEP may grant additional extensions for good cause. If the events causing such delay are not found by NJDEP to be beyond the control of Norda, failure to comply with the provisions of this Administrative Consent Order shall constitute a breach of the Administrative Consent Order's requirements. The burden of proving that any delay is caused by circumstances beyond Norda control and the length of such delay attributable to those circumstances shall rest with Norda. Increases in the costs or expenses incurred in fulfilling the requirements contained herein shall not be a basis for an extension of time. Similarly, delay in completing an interim requirement shall not automatically justify or excuse delay in the attainment of subsequent requirements.

16. Reservation of Rights

This Administrative Consent Order shall be fully enforceable in the New Jersey Superior Court having jurisdiction over the subject matter and signatory

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parties upon the filing of a summary action for compliance pursuant to the Environmental Cleanup Responsibility Act, N.J.S.A. 13:1K-6 et seq. This Administrative Order may be enforced in the same manner as an Administrative Consent Order issued by NJDEP pursuant to other statutory authority and shall not preclude NJDEP from taking whatever action it deems appropriate to enforce the environmental protection laws of the State of New Jersey in any manner not inconsistent with the terms of this Administrative Consent Order. It is expressly recognized by NJDEP and Norda that nothing in the Administrative Consent Order shall be construed as a waiver by NJDEP of its rights with respect to enforcement of ECRA on bases other than those set forth in the ECRA program requirements section this Administrative Consent Order or Norda's right to seek review of any enforcement action as provided by the Administrative Procedure Act, N.J.S.A. 52:14B-1 et seq. Furthermore, nothing in this Administrative Consent Order shall constitute a waiver of any statutory right of NJDEP to require Norda to implement additional remedial measures should NJDEP determine that such measures are necessary to protect the public health, safety and welfare or of Norda's rights with respect thereto.

17. Norda hereby consents to entry of this Administrative Consent Order and waives its right to a hearing concerning the terms hereof pursuant to N.J.S.A. 52:14B-1 et seq.

18. This Administrative Consent Order shall take effect upon the signature of all parties. Upon the signature of all parties Norda may complete its transaction with Unilever.

NEW JERSEY DEPARTMENT OF
ENVIRONMENTAL PROTECTION

Date: 12/21/84

By: Joseph Rogalski

Joseph Rogalski,
Assistant Director
for Enforcement and Field
Operations

Norda, Incorporated

Date: 1/16/85

By: Louis J Amaducci

Name: Louis J. Amaducci

Title: President

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ECRA CLEANUP PLAN
ADRON/PPF FACILITY
EAST HANOVER, NEW JERSEY
ECRA CASE NO. 84294

AUGUST 2, 1988
JOB NO. 12295-005-10

Dames & Moore

CRANFORD, NEW JERSEY

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1.0 INTRODUCTION

In accordance with New Jersey Department of Environmental Protection (NJDEP) letter of March 24, 1988 and recent telephone discussions with Mr. Kevin Kratina, Bureau of Industrial Site Evaluation Case Manager, Dames & Moore is pleased to present this Cleanup Plan for the former Norda facility in East Hanover, New Jersey. This Cleanup Plan has been prepared in accordance with the Environmental Cleanup Responsibility Act Regulations (NJAC 7:26B) and Draft Sampling Plan Guide, June 6, 1986. This document has been prepared on behalf of Adron, Inc. (formerly Norda), which owned and operated the East Hanover facility prior to 1985. The subject property was sold in 1985 to PPF International and currently is operated by Quest International (successor to PPF International). The 1985 property transfer fell under the jurisdiction of the Environmental Cleanup Responsibility Act (ECRA). The Cleanup Plan is submitted as part of the requirements for ECRA Case No. 84294.

Investigative and remedial activities have been ongoing since 1984. The previous work referenced below and the proposed approach to be utilized for addressing remaining site concerns have been performed and developed on the basis of, and are resultant from understandings and agreements established through, extensive written and verbal correspondence between Adron, their representatives and past case management at NJDEP.

1.1 CONTENTS AND ORGANIZATION OF CLEANUP PLAN

Because the project has received a new case manager, site background and project history are discussed in initial sections of this document. This document presents a review of site conditions, provides a summary of salient correspondence between Adron and NJDEP which guided past investigative and remedial efforts on site, and describes past

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sampling and cleanup activities. Also presented are the results of most recent soil and ground water sampling activities and proposed cleanup activities at remaining areas of concern not yet remediated. Summaries of previous investigative efforts, boring logs and a list of reports and correspondence between Adron and NJDEP are also provided in the Appendices to facilitate NJDEP review.

This document has been prepared to present in logical sequence, a discussion of the requirements for ECRA Cleanup Plans as stated in NJAC 7:26B-5.3. Section 2 of this document describes Site Background. Section 3 presents Project History and Areas of Environmental Concern, including previous investigations. Appendices A, B and C provide results of Historical ECRA Sampling and Analysis as well as a summary of correspondence between NJDEP and Adron and their representatives. Section 3.2 describes the quantity and types of waste materials previously removed from the site and estimates of materials yet to be removed/remediated. Proposed Remedial Actions and Remedial Objectives have been prepared on the basis of site sampling data, evaluation and on the basis of past site remedial efforts. The proposed remedial actions, their extent and rationale are presented in Section 4. Section 5 presents Sampling Methodologies and QA/QC protocols and Section 6 describes Health and Safety procedures. A projected schedule of activities is described in Section 7. A detailed cost estimate is provided in Section 8 and reporting requirements are described in Section 9. Post closure monitoring is described in Section 4.8. Tables and figures which provide additional details to items described in the text are also provided. These include a scaled site map showing areas of concern (Figure 2), a Summary of Proposed Remedial Actions and Objectives (Table 2), Project Schedule (Figure 8) and Cost Estimates (Table 8).

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2.0 SITE BACKGROUND

2.1 PLANT HISTORY

The current operator of the facility is Quest International. In 1985, PPF International obtained the property from Norda pursuant to a sale agreement made between the two parties. Subsequently, Quest assumed operations. Prior to the sale, the same manufacturing operations as described below were conducted. The transfer of plant ownership in 1985 initiated the current ECRA investigations.

The plant site, located at 140 N.J. Route 10, occupies approximately 17 acres in East Hanover, Morris County, New Jersey (Figure 1). The property boundaries roughly define a rectangle whose long axis runs approximately North-South. The site is situated between Route 10 and Murray Road in a commercial section of East Hanover. The site is bounded on the east by a drum recycling company, on the west by the Ramada Inn Motel and a golf driving range, on the north by Murray Road and a warehouse complex, and on the south by Route 10.

The East Hanover facility is an active flavors and fragrances manufacturing plant that supplies raw materials and other ingredients to its customers in this industry. Existing structures on-site include several buildings which consist of storage, maintenance, administrative, laboratory and processing facilities (Figure 2). Processes involved as part of the manufacturing include resale and repackaging of consumer goods, compounding and blending of perfume and flavor materials, extraction of fruits and vegetables, distribution of flavor oils, and research and development. Washwater from equipment cleaning is collected in sumps adjacent to the process buildings or discharged to sanitary drains.

Two historical fires damaged buildings at the site. In 1947, a fire destroyed a building which held cosmetics, spices and essential

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oils. This building was situated east of existing building No. 3 and the concrete pad on which it was built, Platform 7, still remains. In 1960, a fire damaged a second floor laboratory of existing building No. 1. Essential oils, starting materials and finished fragrance compounds were stored in the building. Water used to fight the fire was collected in a "fire pond" located at the southwest corner of the administration building. Subsequently, this area was backfilled and paved over.

In the early 1960's, construction rubble and scattered drums reported to contain hard residues and still bottoms from process activities were backfilled in portions of the area lying between Murray road and the northern portion of the facility. Additional backfilling of this area utilized natural, surficial soils removed during contruction on adjacent properties.

At about the same time, drums reported to contain process waste and aromatic still bottoms, were buried in trenches in the area between the eastern parking lot and eastern fence boundary as well as a buried drum cell east of this fence line. Drums have been identified in the "fire pond" area. The drums were deposited in the clay layer which constitutes the surficial soils found at the site. On-site clayey soils were used as backfill during drum burial. A site plan showing these facilities and areas of investigation is presented as Figure 2.

2.2 GEOLOGIC CONDITIONS

The eastern one-third of Morris County, in which East Hanover is located, lies in the Piedmont Physiographic Province. Climate of this province is classified as continental.

The Norda site is underlain by glacially derived tills, sands, gravels and clays overlying bedrock. Bedrock consists of Triassic Brunswick Formation, a geologic unit consisting of shales and sandstones which comprise the uppermost member of the Newark Group.

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Ground water measurements recorded periodically in nine on-site monitoring wells show that the ground water surface lies at an elevation of ±157 to 160 feet above mean sea level. Boring logs and well construction details for the nine wells are presented in Appendix A. The ground water surface lies between approximately 40 and 60 feet below existing ground surface within the sands and gravel deposits. Ground water elevations are presented on Table 1.

Total difference in ground water elevation across the site is less than two feet. A ground water elevation contour map is presented in Figure 3. Ground water flow direction, as determined by measurements obtained in 1984 and confirmed in 1986 and 1988 is to the southwest.

3.0 PROJECT HISTORY

ECRA activities, including Site Investigation and Site Remediation have been ongoing since 1984. Activities at the site have been coordinated with NJDEP and the results of each phase of the investigations have been provided to NJDEP. The completed site activities which have led to the current status at the site have been documented through submittal of reports, data packages, progress reports, letters and telephone discussions between NJDEP and Adron and their representatives. To facilitate ease of understanding the process and history of the project, a summary of significant correspondence and events is provided in Appendix B. As indicated by the appendix, site activities have been performed as coordinated with and approved by NJDEP.

Initial efforts at the site consisted of assessing hydrogeologic conditions and identifying areas of concern which warranted evaluation and potential cleanup. Subsequent activities included refining the understanding of site conditions, efforts to delineate the extent of contamination through implementation of the NJDEP-approved ECRA Sampling Plan and cleanup activities to remove buried drums from the site through implementation of the NJDEP-approved ECRA Drum Removal Plan incorporated

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The Piedmont Physiographic Province is characterized as a region of low-lying plains and gently sloping hills with occasional basalt ridges. Altitudes are on the order of 200 to 400 feet above mean sea level. Present day physical features and topography are primarily the result of Pleistocene glacial episodes with the most recent episode, Wisconsin Glaciation, having created the features which are currently most visible.

A terminal moraine extending northwest through Morris County is the largest glacial feature in the area. The moraine marks the southermost extent of the Wisconsin glacial advance. The facility is bounded to the south and west by the moraine which passes through the towns of Chatham, Livingston and Morristown. During the Pleistocene Glaciation, channels cut in the existing bedrock surface by the Passaic River drainage system served as conduits through which limbs of the glacier passed. As a result of the glacial advance, these ancient river channels were filled with coarse sands and gravels that today serve as primary aquifers in the area.

As the glaciers retreated, meltwater from the ice mass was trapped by the relatively impermeable moraine. Water which collected formed Glacial Lake Passaic whose existence is marked by fine clays and silts that mantle the area today.

2.3 SITE STRATIGRAPHY AND GEOHYDROLOGY

Stratigraphy encountered at the site consists of approximately 14 to 20 feet of relatively impermeable clayey soils overlying glacial sands and gravels. The sands and gravels contain varying amounts of fines in pore spaces and these deposits tend to grade coarser with depth. Portions of the surface cover include fill deposits containing construction debris and other refuse. Bedrock was not encountered during any of our investigations but is believed to be at depths on the order of 120 to 140 feet below ground surface.

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in the ECRA Sampling Plan and Drum Removal Plan prepared by the contractor.

3.1 AREAS OF ENVIRONMENTAL CONCERN AND PREVIOUS INVESTIGATIONS

Areas of environmental concern which have been the subject of the majority of site activities were identified on the basis of site conditions, previous investigations and comments from previous NJDEP Case Manager, Mr. Yilmaz Arhan. These areas, as identified in the ECRA Sampling Plan, are:

Area Designation	Description
S-1	Three sumps used to collect and contain process wash water
S-2	Septic systems
S-3	Fire pond area south of Buildings D and B-1
S-4	Drum cleaning area located northeast of Building No. 22
S-5	Fill area between Murray Road and the plant's northern portion of the plant containing scattered, buried drums
S-6	Disposal area along eastern fence line in which drums containing process materials were buried in discrete cells

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S-7	Building No. 1 and Platform No. 7 which were damaged by historical fires
S-8	Northern catch basin
S-9	Dumpster
S-10	Catch basin at Vehicle Maintenance Building
S-11	Stained soil at fuel oil tanks
A	Background soil quality area located near plant entrance from Route 10
B	Ground water quality on-site

Drums were encountered during installation of a water line located northwest of Building 22. These drums lie within Area S-5. Limited drum removal was performed at this area as part of an Immediate Remedial Action to allow completion of the water line.

The initial study of site conditions was documented in Dames & Moore's November 7, 1984 report, "Geohydrologic Investigation and Consultation, Norda, Inc. Manufacturing Facility, East Hanover, New Jersey." Subsequently, an ECRA Sampling Plan was submitted on August 14, 1985 and sampling and investigation of each area of concern has been performed pursuant to the approved ECRA Sampling Plan. Tables summarizing areas of concern, investigation completed at each area, and analytic data as well as a map depicting sampling locations originally submitted in the May 5, 1986 report, "ECRA Sampling Plan Results", are presented in Appendix C. On the basis of the sampling results and

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correspondence with NJDEP, no further investigation is required at areas S-1, S-2, S-4, S-9, S-10 and A. Remaining areas are the subject of additional, future sampling and remediation.

The completion of activities on site has been performed as coordinated with NJDEP, Adron and Adron's representatives. On the basis of these activities and correspondence, the following areas of concern require continued investigation and remediation:

Area S-3	Fire Pond
Area S-5	Fill Area north of plant area and south of Murray Road
Area S-6	Disposal Area - Drum Cells Nos 1 - 5
Area S-7	Fire Platform
Area S-8	Northern Catch Basin
Area S-11	Stained soil at fuel oil tanks
Area B	Ground Water

These remaining areas are depicted on Figure 2. Each of these areas and the forthcoming sampling/cleanup activities at each is described in Section 4, below.

3.2 PAST WASTE REMOVAL

Remedial activities have been initiated at Area S-6, Drum Disposal Cells Nos. 1 through 5. Remedial activities have included excavation and off-site treatment/disposal of buried drums, backfill and perched water from the five drum cells. A total of 4,606 drums were removed, 4,630 cubic yards of backfill and 173,750 gallons of perched water were removed from this area during drum remedial activities in 1986. Remaining areas which will be remediated include the Fire Pond and Area S-5. It is estimated that on the order of 1,500 drums will be removed from these areas and on the order of 6,000 cubic yards of soil

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will be removed or remediated from these areas. Details of historical drum removal operations have been previously submitted to NJDEP and are reviewed in Section 4 of this document. Section 4 also presents details of proposed on site cleanup activities. Estimates of quantities of on-site material yet to be remediated are presented in Sections 4 and 8 of this document.

4.0 PROPOSED CLEANUP/SAMPLING ACTIVITIES

This section of the report presents a description of proposed sampling and cleanup activities for remaining areas of concern. A summary of these proposed activities is provided on Table 2.

4.1 CLEANUP CRITERIA

Cleanup criteria for remaining areas of concern have been developed on the basis of ECRA guidelines, previously completed remedial activities, practical limits of earth working operations, and the discussions and understanding reached with NJDEP during the performance of recently completed site work. Cleanup criteria are briefly noted below. Sections 4.2 through 4.8 of the Cleanup Plan present discussions of remedial actions proposed at each area of concern, and appropriate cleanup strategy and criteria are incorporated as part of these discussions.

Area S-3, Fire Pond:	Removal and off-site disposal of all drums and visually contaminated soil. Post excavation sampling and additional soil removal at hot spots, to the degree practical, to reduce residual compound concentration levels to 10's of ppm.
Area S-5, Fill Area: South of Murray Road:	Removal and off-site disposal of all durms. In place fixation and stabilization of soils to a depth of 5 feet or excavation and removal of soil.

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Area S-6, Drum Cells:	Removal and off-site disposal of drums and visually contaminated soil. Post excavation sampling and additional soil removal at hot spots to the degree practical to reduce residual compound concentration levels to 10's of ppm.
Area S-7, Fire Platform:	Deeper soil sampling to evaluate the extent of residual compounds. Limited soil removal at hot spots, if warranted.
Area S-8, Catch Basin:	Off-site disposal of all sediment. Removal and installation of an oil boom.
Area S-11, Stained Soil at Fuel Tanks:	Removal and off-site disposal of visually stained soil. Post excavation sampling and additional removal, if warranted, until petroleum hydrocarbon levels are 400 ppm or less.
Area B, Ground Water:	Continued sampling and analysis of existing monitor well network for two years.

4.2 AREA S-3, FIRE POND

The fire pond area is located west and southwest of the maintenance shop (Figures 2 and 4). The fire pond was a lowlying area which accumulated water used to fight the historical fire at Building 1. The area was subsequently backfilled and paved over. A soil sample from the base of the fire pond was obtained during ECRA Sampling Plan implementation and low levels of volatile organics were detected.

To further assess this area, additional sampling will be performed as approved by and described in NJDEP July 23 and December 19, 1986 letters and Dames & Moore's September 29, 1986 letter. Two borings will be advanced at the fire pond and samples obtained from each at depths of 10 and 15 feet below grade. Each sample will be analyzed for priority pollutant (except pesticides) with forward library search. It should be noted that buried drums identified in the area of the fire pond will be removed shortly (see below). During drum removal, remedial activities will extend across the area covered by the fire pond. It is

likely soil and drum removal will incorporate areas of the fire pond. In this instance, drum removal will be completed prior to the fire pond sampling. If field conditions are significantly different than expected, the fire pond sampling may have to be revised. NJDEP will be advised as to project activities.

Drums were encountered on site during installation of a sanitary sewer line on May 13, 1986. The exact extent of the drums has not been determined. However, neither a boring advanced to the east of the sewer line, a test pit located to the southeast nor an underground fire protection system line located to the southwest encountered drums. This indicates that the drum location is restricted to an area within these boundaries.

Cleanup activities will be performed in accordance with the procedures described in the Drum Removal and ECRA Sampling Plans previously approved by NJDEP. Excavation will be accomplished with track-mounted excavators and rubber-tired excavators, utilizing smooth bucket and drum slings. In accordance with previous remedial efforts on site, equipment and personnel utilized for drum and soil removal, shipment and disposal will include Waste Conversion of Hatfield, Pennsylvania, Enroserv of Clayton, New Jersey, and Wayne Disposal and/or Michigan Disposal of Belleville, Michigan. Individual drums will be removed from the excavation, staged, loaded into overpacks as necessary, numbered and sampled. After sampling, drums will be loaded into dump trailers for off-site disposal. Contaminated backfill and soils from the excavation will be removed by backhoe, sampled and loaded into dump trailers for off-site disposal. These materials may be temporarily stored on site to facilitate scheduling of trucks. Semi-liquid wastes and perched water will be controlled at the excavation utilizing a vacuum truck. The vacuum truck will discharge to bulk tankers on-site for testing and off-site disposal.

The excavation will continue until all drums, liquid and visually contaminated backfill are removed and natural soils are

exposed. It is likely that this activity will encompass the area of the former Fire Pond. As previously performed and approved at Area S-6, post excavation sidewall and bottom samples will be collected on approximately 30-foot centers for analysis of full priority pollutants with forward library search. Arrangements will be made to receive emergency turnaround time (one-two weeks maximum) from the laboratory. If hot spots are identified with residual organic compounds with concentration levels in the 100's of ppm range, limited additional soil removal at the hot spots may be performed to reduce levels of residual compounds remaining in the excavation, if any, and a second set of post excavation samples would then be obtained to evaluate reduced levels of residual compounds. However, because of the impact that the excavation poses on the facility's ability to conduct business, it may be necessary to backfill the excavation after removing the potential sources of contamination (drums and backfill) but prior to receipt of laboratory data. If such an approach is necessary, post backfilling samples can be obtained using a drill rig as described for fire pond sampling, if necessary.

4.3 AREA S-5 - FILL AREA NORTH OF FACILITY AND SOUTH OF MURRAY ROAD

Area S-5 is the fill area located north of the active plant facility and Murray Road. Portions of this flat lying field contain buried construction debris and discarded drums containing plant process wastes. This area differs from Area S-6, drum disposal cells 1 through 5, in that at Area S-5, drums appear to have been randomly placed with fill rather than placed in trenches with easily identifiable boundaries. Because of random placement, the drum density, i.e., number of drums per given area, is significantly lower than observed at Area S-6. Furthermore, drums in Area S-5 have been observed to be placed in clayey backfill at relatively shallow depths, approximately 0 to 5 feet below grade. The backfill overlies natural clays.

A magnetometer survey was performed over a portion of Area S-5 in 1984. Delta Geophysical Sevices performed a second survey in 1985

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across the entire open area between Murray Road and the northern fence line, encompassing the area of the first survey. Subsequent analysis and test pit exploration (which included the excavation of 20 exploratory test pits) indicated that buried iron was restricted to the uppermost 4 to 8 feet of fill which mantles the area. Buried construction rubble was also responsible for some of the magnetic anomalies identified in the surveys.

Because of the random placement of drums in this area, the locations of drum deposits has been estimated from test pit and magnetometer survey data. Construction rubble is responsible for some of the magnetic highs observed in Area S-5, particularly in the northwestern portion of the area. We have estimated the areal limits of anticipated buried drums on Figure 5. Some variation should be expected and the actual extent of drums and the removal efforts will be controlled by conditions encountered during site remediation. During removal in this area, additional exploratory test pits extending from the anticipated edge of the drum deposits and others extending perpendicular to previously excavated test pits can be used to further define the extent of drum deposits and thereby provide controls on the extent of excavation.

4.3.1 Area S-5 Proposed Cleanup Plan

Cleanup activities in Area S-5 will consist of a combination of remedial strategies. Scattered drums will be removed from the area, manifested and disposed off-site. After removing drums, the uppermost soil in the areas of drum disposal may be subject to fixation and stabilization to remediate residual compounds which may remain in the near surface fill.

Fixation is a remedial technique used to render immobile chemicals within the soil matrix and thus prevent their leaching into deeper soil zones or the ground water. The soil can be excavated and mixed on the surface with fixation chemicals or mixed in place.

Chemical fixation products commonly used are inorganic polymers that react with the soil and chemical constituents to form a crystalline polymer network in a two-stage reaction. The first stage is a fast reaction that alters the organic and inorganic constituents of the waste, while in the second stage the physical characteristics are changed from a gel to a crystalline, inorganic polymer. The end product is a solidified product similar to a concrete block or monolith which is designed to pass the EP Toxicity and leach tests.

Several vendors report to have the technology and experience to implement full scale in situ fixation. The immobilization process creates a hardened, leach-resistant, concrete-like mass. Several regions of the USEPA have accepted the in situ treatment technology as being consistent with the provisions of SARA and the NCP. Projects are currently proceding which involve immobilization demonstrations at Superfund sites for soils containing organic and inorganic chemicals.

A major advantage associated with this remediation approach is that the stabilized soil would act as one large containment system. Stabilization of the soil would minimize surface water from entering the fill layer. Containing the soil in this manner would effectively minimize or eliminate chemical migration into the underlying soils since the zone of residual soil contamination is stabilized, compounds are fixated and the driving forces from liquid penetration would be eliminated. Compounds already in the clay layer would not be permitted to migrate any deeper and would, therefore, be trapped unless the driving force from infiltration was to resume, an event that would not occur given the stabilization of the soil and residual compounds above.

A complete bench scale and pilot scale testing program will be established and completed prior to implementing this remedial approach at Area S-5. The program will be prepared and performed as coordinated with NJDEP. The results of the testing will be provided to NJDEP upon completion. Components of the plan are described below.

In Area S-5, there are two major zones, Zone A and Zone B, as shown in Figure 5, which have been interpreted as major zones of drum disposal. These two zones will be the primary zones subject to remediation. Smaller zones which have been identified will also be remediated. The program will consist of a series of phases to allow for optimum design followed by implementation of the site work. Once initiated, the program will move forward, completing each phase of the work until project completion. The components of the program are as follows:

- o Characterize soil in the two primary zones of drum disposal.
- o Prepare and implement bench scale studies of soil immobilization/fixation admixtures.
- o Prepare and implement pilot scale field study.
- o Implement full scale site work.

Details of each phase is provided in the text below.

4.3.1.1 Soil Characterization

A series of eight test pits will be advanced in the two primary zones of area S-5 subject to stabilization (Figure 5). One soil sample will be obtained from each test pit at a depth of 2 to 4 feet (within the zone anticipated to be stabilized) at locations of visible contamination. Two additional deeper samples will be obtained from each test pit at depths of 5 to 6 feet and 9 to 10 feet. The three samples from each of the eight test pits (24 soil samples, total) will be analyzed for priority pollutant volatile organic compounds, base/neutral organic compounds, petroleum hydrocarbons and oil and grease. It is these suites of compounds which have been identified through testing at drum cells to be of concern. The purpose of these samples is to assess locally the

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vertical extent of compounds and establish the depth of soil which will be subject to soil stabilization. These samples will also serve as the post excavation/remediation samples. In addition to the chemical analysis, soil samples from 2 to 4 foot horizon will be geotechnically tested for grain size distribution and moisture content. Test results of these parameters and chemical analysis will be used during evaluation of the soil stabilizing agents and additives to establish the optimum mix parameters.

4.3.1.2 Bench Scale and Treatability Testing

Bench scale and pilot treatability studies would be required to evaluate the technology for the Adron site. Preliminary batch tests will be carried out using bulk samples of representative soil obtained in Zones A and B in Area S-5. The effectiveness of the process could be tested through performance of Toxicity Characteristic Leaching Procedures (TCLP), modified ANS 16.1 leach tests, and immersion/leach tests on the treated soil. Additional testing will include geotechnical and chemical characterization of soils beneath the work area and structural testing of the resulting monolith. A bench scale testing program will be developed during soil characterization efforts and the program implemented upon its completion.

Bulk soil samples representative of the zone of immobilization will be submitted to contractors for preparation of bench scale mixtures. Dames & Moore has established contact with several contractors for similar projects requiring bench scale studies. These vendors have both in situ and ex situ soil mixing/stabilization experience and/or chemical fixation experience as part of remedial action activities. On the basis of chemical and physical testing of soil samples, optimum mix parameters and additives will be assessed to develop a cost effective design which successfully immobilizes residual compounds of concerns which may exist in subsoils. After completing these studies, a refined cost estimate for implementation can be prepared to evaluate the cost-

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4.3.1 Field Implementation

On the basis of the pilot scale test results, a detailed Implementation Plan will be prepared and, if economically feasible, the program will then be implemented throughout the remaining portions of Area S-5. The program components are described below.

Drum removal will be carried out in a manner similar to the removal efforts already performed at Area S-6, utilizing backhoes, drum slings and vacuum trucks. To facilitate logistic arrangements and allow for better control and security during removal, localized sections of the disposal area will be worked at one time.

During drum removal, drums will be segregated from surrounding backfill and soils excavated to a depth of five feet or until visually contaminated soils are removed. Double-lined plastic tarps can be used as temporary staging platforms, with the presently bermed portion of the parking area used for drum storage until off-site shipment. Access for dump trailers and support vehicles can be provided with crushed stone access roads if the grassy area becomes wet of soft. Excavated soils will be stockpiled adjacent to the plant's fenceline.

A detailed implementation plan will be prepared. Typically, activities will occur in the following fashion. Soil from the stockpile would be fed to a pug mill. Usually, the immobilizing silicate-based reagent, prepared beforehand to be a colloidal liquid product, would be added to a preset quantity of soil and mixed in place or at the pug mill. The amount of reagent and admixture is dependent upon the quantity of soil being batched, the level of chemical concentrations present, and the physical properties of the soil determined beforehand by trial mixes to produce a nonleachable mass or monolith. The wet mix from the pug mill will be returned to the excavation site for in situ curing.

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After curing, four core samples from Zone A and two core samples from Zone B will be obtained from the monolith. These samples will be subject to immersion and leach testing to assess the characteristics of the completed remedial action.

After completing bench scale treatability studies and final design for the fixation/stabilization admixture, a refined cost estimate for implementation of the remedial approach can be prepared. If in situ stabilization is not deemed cost-effective, then drum removal, soil excavation and off-site disposal may be performed as an alternative. Implementation would be performed in a manner similar to that described above.

4.4 AREA S-6 DISPOSAL AREA - DRUM CELLS NOS. 1-5

4.4.1 Previous Activities

Five drum cells designated Cell Nos. 1 through 5 are located in Area S-6 at the facility's northeast fence corner. Drum removal activities at the five drum cells is completed. Removal has been performed in accordance with the Drum Removal Plan as revised and approved in NJDEP letter of November 4, 1985. Post Excavation Sampling has been performed in accordance with the ECRA Sampling Plan as revised during the July 31, 1986 meeting, NJDEP's letter of October 2, 1986 and Dames & Moore's letter of August 28, 1986.

At each of the five excavations, drums, perched water and contaminated backfill were removed via backhoe, drum slings and vacuum trucks until natural soils were exposed. Post excavation samples were then obtained from excavation bottom and sidewalls. After additional excavation at "hot spots" which were identified by sampling, Drum Cell No. 4 has been backfilled. Post excavation sampling data from Drum Cell Nos. 2 and 3 was submitted to NJDEP in 1986 in a letter report with recommendations to backfill and close the excavation. This submittal is apparently still under review. We have included a copy of the letter

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report as Appendix D to the Cleanup Plan. We plan to implement the activities proposed in the letter report as part of the Cleanup Plan implementation. Post excavation sampling data from Drum Cells Nos. 1 and 5 are presented below.

4.4.2 Drum Cell No. 1 Sampling Data

Post excavation samples were obtained from open drum cells, Cell Nos. 1 and 5 on April 28, 1988. Laboratory data has only recently been received and is presented on Tables 3, 4, 5 and 6 in this report. Sampling locations are provided on Figure 6. A copy of the laboratory report is enclosed with this report.

Post excavation sidewall and bottom samples were obtained using dedicated, precleaned stainless steel trowels. Samples were collected from approximately 6-inch depth. Sidewall samples were obtained approximately midpoint of the sloughed sidewalls. At Cell No. 1, a total of four bottom and six sidewall samples were taken. Each sample was analyzed for petroleum hydrocarbons and full priority pollutants (except pesticides) with forward library search.

The results of analysis indicate that at Cell No. 1, no base/neutral compounds were detected in sidewall samples. Methylene chloride, detected at 12 ppb or less is the only priority pollutant volatile compound detected. No PCBs were detected. With the exception of mercury, detected at 1.75 ppm and 1.04 ppm at locations SW-2 and S-6, respectively, no priority pollutant metals exceeded ECRA action guidelines. Total phenols were identified at location SW-1 at 7.7 ppm and SW-3 at 10 ppm. Petroleum hydrocarbons concentrations slightly above ECRA action guidelines were identified at SW-1 and SW-6.

At the four bottom sample locations in Cell No. 1, methylene chloride and 1,3-dichlorobenzene are the only priority pollutant volatiles detected. These compounds were detected at trace levels well

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below ECRA action guidelines. Bis-2-ethylhexyl phthalate is the only priority pollutant base/neutral compound detected. At locations B-2 and B-3, concentration levels of this compound slightly exceeded ECRA action guidelines. No PCBs or priority pollutant metals are identified above action criteria. Low levels of phenols, 1.9 and 1.7 ppm at locations B-1 and B-2 respectively, were detected. At locations B-2, B-3 and B-4, petroleum hydrocarbon levels slightly exceeded ECRA action guidelines with concentration levels of 160, 230 and 146 ppm respectively.

4.4.3 Drum Cell No. 1 - Proposal to Backfill

Laboratory data from post excavation samples indicate that at several locations, very low levels of petroleum hydrocarbons, bis-2-ethylhexyl phthalate and mercury exist at levels only slightly above ECRA action criteria. A second round of samples will be obtained from these locations at depths of 1-1/2 feet and analyzed for target compounds. If data indicates attenuation of compounds by this depth, an additional 1 to 1-1/2 feet of soil will be removed and disposed off-site. If sufficient attenuation is not observed at this depth, then deeper soil samples will be obtained to assess the extent of soil which needs to be removed.

Proposed additional sampling program at 1-1/2 foot depth is as follows:

Cell No. 1	Sidewall Location	Analysis
	SW-1	Petroleum Hydrocarbons
	SW-2	Mercury
	SW-6	Petroleum Hydrocarbons and Mercury
Cell No. 1 Bottom		
	B-2	Petroleum Hydrocarbons
	B-3	Petroleum Hydrocarbons
	B-4	Petroleum Hydrocarbons

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The post excavation sampling and additional, limited soil removal will be performed in accordance with past approved practices and methods which guided previous remedial efforts on site. After limited soil removal, the excavation will be backfilled with clean fill and crowned with clayey soils.

4.4.4 Drum Cell No. 5 Sampling Data

A total of five sidewall samples and four bottom samples were obtained and analyzed from Drum Cell No. 5 in the same manner as described for Cell No. 1. At the sidewall and bottom samples, no priority pollutant organic compounds were identified at levels above ECRA action guidelines. Cadmium was detected slightly above ECRA action criteria at B-1. At two of the five sidewall locations, SW-1 and SW-5, petroleum hydrocarbons were detected at 1,200 and 970 ppm. At two of the bottom locations, B-1 and B-2, petroleum hydrocarbon levels are both at 1,200 ppm. Sampling locations are shown on Figure 6 and laboratory data is provided on Tables 5 and 6.

4.4.5 Drum Cell No. 5 - Proposal to Backfill

Petroleum hydrocarbon levels were detected at four locations at the eastern end of Cell No. 5 at levels above ECRA action levels. At these locations, SW-1, SW-5, B-1 and B-2, additional samples will be obtained at depths of 1-1/2 feet and analyzed for petroleum hydrocarbons. If analysis indicates attenuation of hydrocarbons at this depth, limited soil removal will be performed at these locations and the soil disposed off-site. If sufficient attenuation is not observed at this depth, then deeper samples will be obtained to assess the extent of soil which needs to be removed. The excavation will then be backfilled with clean fill and crowned with clayey topsoil.

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4.5 AREA S-7 - FIRE PLATFORM

Platform 7, located on the east site of the facility,was the site of a building destroyed by fire in 1947 (Figure 2). A soil composite sample was obtained from surface soils east of the platform and analyzed for priority pollutants. Low levels of volatile organic compounds were detected. Data are presented in Appendix C. Additional investigation will be performed as described in Dames & Moore's May 5 report and September 29, 1986 letter. Two borings will be advanced east of the platform and discrete soil samples obtained from each at depths of 5 and 10 feet. Each sample will be analyzed for priority pollutant volatile organic compounds. The samples will be obtained to evaluate the potential migration of compounds identified in the original surface composite sample. If no migration of compounds is observed, then no additional activity is necessary. If samples contain compounds at elevated concentration levels, additional sampling to evaluate the extent of compounds and, if necessary, limited removal at hot spots, will be performed.

4.6 AREA S-8 - CATCH BASINS

Sediment samples were obtained from the catch basins at the vehicle maintenance shop and the junction box located immediately outside the facility's northwest fence corner. Petroleum hydrocarbons were detected at the northern catch basin and remedial actions proposed. Data are provided in Appendix C. The sediment will be removed by a vacuum truck and an oil boom placed in the basin as described in Dames & Moore's May 5, 1986 report and approved in NJDEP's July 23, 1986 letter. These activities will be performed when on site drum removal activities resume.

4.7 AREA S-11 - STAINED SOIL AT FUEL OIL TANKS

Stained soil has been observed around the fill pipes at the fuel oil storage tanks fill pipes. As proposed in the Dames & Moore May 5, 1986 report and approved by NJDEP in the July 23, 1986 letter, this area

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will be remediated by removing visually stained soil for off-site disposal. If stains extend greater than one inch in depth, post excavation sampling for petroleum hydrocarbons will be performed in accordance with NJDEP's suggestion. If sampling is necessary, soil removal will continue until petroleum hydrocarbon levels are 400 ppm or less.

4.8 AREA B - GROUND WATER

Ground water monitoring has been performed on-site since 1984. Five monitoring wells, MW-1 through MW-5 were installed in 1984. A sixth monitoring well, MW-6 was installed in 1987 and three additional monitoring wells, MW-7 through MW-9 were installed in 1988. Well locations are shown on Figure 2 and boring logs and well construction summaries are presented in Appendix A. Ground water samples have been obtained in November 1984, March 1987 and May 1988. The 1984 samples were analyzed for full priority pollutants with library search, the 1987 samples were analyzed for targeted compounds - volatile organics and the 1988 samples were analyzed for volatile organics and base/neutral compounds with forward library search.

The results of the 1988 analyses are presented on Table 7. A copy of the laboratory analytic report is included with this report. Historical data are presented in Appendix C. The data indicate that low to mid levels of volatile organics are present in ground water samples. Compounds and concentration levels detected are similar throughout the period of the monitoring program with several exceptions. The number of compounds and their concentration levels detected at well MW-1 have decreased since 1984. Carbon tetrachloride, a compound identified by NJDEP as being of concern, has decreased in concentration at MW-1 from 69 ppb in 1984 to 7.2 ppb in 1988. Conversely, the concentration levels of trichloroethylene and 1,1,1-trichloroethane detected in well MW-5 have increased during the period of monitoring. Trichloroethylene was

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detected at BMDL values in 1984, at 33.4 ppb in 1987 and at 165.4 ppb in 1988 at MW-5. 1,1,1-trichloroethane was detected at 24 ppb in 1984, 215 ppb in 1987 and 676 ppb in 1988. Samples obtained from other upgradient wells MW-6 and MW-9 also contained low levels of chlorinated volatile organic compounds. With the exception of trichloroethylene and 1,1,1-trichloroethene noted at well MW-5 and trichloroethylene detected in MW-2, all priority pollutant volatile organic compounds are detected at levels below 50 ppb and in most cases at levels below 20 ppb in the latest round of sampling data.

Site remediation efforts are ongoing. The most significant proposed remedial actions include drum removal at the fire pond and Area S-5, in addition to those items already achieved. There appears to be a minor upgradient contributor to compounds detected in ground water, and at MW-1, the number of compounds and concentration levels appear to be decreasing. Well MW-7 has only recently been installed and data from one round of sampling is available. The only compounds detected at MW-7 are methylene chloride at 19.9 ppb (methylene chloride is a common laboratory introduced compound and was detected in the field blank) and trichloroethylene at 6.8 ppb.

Continuation of the current ground water monitoring program is recommended. The monitoring effort should be continued throughout the period of site remediation and after remedial work is completed. The program will include biannual sampling of all existing wells for priority pollutant volatile organics and base/neutral organics with forward library search and TDS and pH. Samples will be obtained using NJDEP-approved sampling procedures as described in the Approved ECRA Sampling Plan and as utilized during previous sampling events.

After completing site cleanup and obtaining ground water sampling data, the data will be evaluated. Two years of monitoring data will be reviewed to assess if ground water quality is improving during the period of site remediation. If improvement of ground water is

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observed, then the monitoring program will be discontinued. If static conditions or degradation unrelated to off-site factors are observed with respect to ground water quality, monitoring will be continued.

4.8.1 Contingency Ground Water Remediation Plan

NJDEP has requested that as a contingency, a ground water interceptor program be evaluated. The contingency program might serve as a potential means of controlling ground water at the downgradient portion of the site and be directed toward addressing site-related ground water conditions and quality. Components of such a system are described below.

Ground water underlying the Adron facility site in East Hanover, New Jersey exists within the buried valley aquifer consisting of glacial fluvial deposits overlain by a surficial silty clay layer. Water levels within the aquifer are below the base of the silty clay layer at the site. Therefore, the aquifer appears to be under water table or unconfined conditions.

The ground water flow direction is to the southwest, from the Murray Road side of the property toward the Route 10 side of the property. Water levels fluctuate with the seasons in excess of one foot.

Ground water contaminants on site consist of volatile organics in the low to mid parts per billion range. If necessary, in order to intercept and recover the ground water, one or more ground water recovery wells would be required near the downgradient end of the property, near Route 10. It should be noted that if installed, interceptor wells will likely influence ground water flow off-site and may allow for ground water of unknown quality from adjacent properties to be drawn onto the site. At the present time there is not enough data available to make a reliable estimate of the pumping rate which would be required to form a sufficiently large zone of capture to intercept the contaminated ground water on site. In order to obtain these data, an aquifer performance

TABLE 1

SUMMARY OF GROUND WATER ELEVATIONS
ADRON/PPF FACILITY
EAST HANOVER, NEW JERSEY

Monitoring Well	Elevation PVC (msl)	Depth to Water (ft. below PVC)	Elevation of Water Surface
MW-1	210.53	53.30	157.23
MW-2	218.27	60.58	157.69
MW-3	202.38	44.08	158.30
MW-4	205.99	47.76	158.23
MW-5	201.40	42.82	158.58
MW-6	205.43	46.87	158.56
MW-7	218.33	60.90	157.43
MW-8	206.22	48.45	157.77
MW-9	202.07	43.39	158.68

NOTES:

Survey data provided by RBA Group, Morristown, New Jersey.

Ground water levels are as recorded by M-Scope on May 16, 1988.

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TABLE 2

SUMMARY OF PROPOSED CLEANUP ACTIVITIES
ADRON/PPF FACILITY
EAST HANOVER, NEW JERSEY

Area Description	Previous Investigation	Proposed Cleanup Activities
	AREA S-3	
Fire Pond - Lowlying area into which water from fire fighting efforts flowed. Located west of vehicle maintenance building.	One sample from boring 108 during ECRA Sampling Plan. Analysis indicated low levels of volatiles at base of fire pond (see Appendix C).	Two continuously sampled borings advanced to 15 feet. Samples from 10 and 15 feet analyzed for full priority pollutants (except pesticides) with forward library search.
	Drums observed during excavation of sanitary sewer line. Excavation lined with plastic, backfilled and repaved until final remediation.	Excavate drums and backfill until exposing native soils. Obtain post excavation soil samples to document extent of cleanup and attenuation of residual compounds in subsoils.
	AREA S-5	
Fill area north of plant and south of Murray Road containing scattered drums and construction rubble.	Magnetometer survey coverage of area. Twenty (20) test pits excavated - encountered drums in near surface fill overlying clayey soils. One soil sample obtained 8 feet below grade beneath drum did not exceed ECRA cleanup criteria.	Removal and off-site disposal of drums. Immobilization of residual compounds in soil using fixation/immobilization technology. Bench scale, pilot scale and treatability studies to be performed prior to field implementation.
	AREA S-6	
Disposal Area - Drum Cells Nos. 1, 2-3, and 5 at northeast corner of facility.	Source has been removed by excavation and disposal of drums, backfill and perched water. Post excavation samples obtained indicate several "hot spots" primarily due to residual petroleum hydrocarbons.	Obtain second round of post excavation samples for target compounds at greater depth to illustrate attenuation of residual compounds in Cell Nos. 1 and 5. Limited additional soil removal at hot spots.

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test would be necessary. If an interceptor program is required, this aquifer performance test would be performed in several steps in order to optimize the location and size of the recovery well(s).

The first step would consist of performing short-term pumping tests about one hour long on each of the existing on-site wells. These tests will be used to estimate the specific capacity, production rate, and transmissivity for each well location. Because of the short duration of the tests and the expected water table response, drawdowns will probably not be observed in nearby monitor wells during the tests.

After evaluation of the pumping test results, a recovery well could be designed. The location of the recovery well would probably be southeast of MW-1 near the edge of the property. The idea is to attempt to locate a downgradient recovery well near the center of the ground water flow path which is coincident with the long axis of the property. This would allow for controlling ground water flow at the downgradient portion of the site. Locating the recovery well with this criteria in mind may be constrained because of the notch in the southeast corner of the property for which Adron does not have access.

Design factors to be considered in the recovery well would be the length and diameter of screens, slot size, gravel pack size, pump size and flow rates. The recovery well will be installed utilizing the design criteria.

After installation of the recovery well, a long-term pumping test (about 24 hours) would be performed. Water level drawdowns would be measured in the recovery well and in the existing network of monitor wells. On this basis the optimum pumping rate for the recovery well would be evaluated. Two water samples will be collected from the well during the test; one at the start of the test and one at the end of the test. These water samples will be analyzed for the constituents of concern in order to provide data to be used in designing a treatment

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strategy for the recovered ground water. In addition, these data can be compared with sampling data from existing monitoring wells to evaluate and compare ground water quality at the point of recovery with ground water quality entering the site. In this manner, the system can focus on addressing site-related issues. The system would not be intended to address off-site influences to ground water quality. It is possible that water can be discharged directly to the sanitary drain without pretreatment. Otherwise, pretreatment using air stripping and/or activated carbon treatment may be appropriate.

It is anticipated that the results of the 24-hour pumping test may be sufficient to project whether additional recovery wells would be required. However, if the 24-hour test is not sufficient, then the recovery well could still be put on line by itself. Water levels in the monitor wells could then be monitored for several weeks. Water level contour maps would then be prepared on a weekly basis, depicting the growth of the zone of capture. At the end of a month, the zone of capture likely will be sufficiently assessed to evaluate and project:

1. if additional recovery wells are needed;

2. how many recovery wells are needed;

3. the locations of the additional recovery wells; and

4. the pumping rates for the additional recovery wells.

Based on this analysis, additional required recovery wells could be designed and installed. After completing the ground water monitoring program described in Section 4.7, ground water quality over time and subsequent to site cleanup will be assessed. If site-related degradation of ground water is observed, then the need to implement the contingency program can be evaluated.

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5.0 SAMPLING METHODOLOGY AND QA/QC

Sampling will be performed utilizing procedures previously used on site. The procedures are those described in the approved ECRA Sampling Plan prepared for the site and conform to NJDEP's Draft Sampling Plan Guide. Laboratory analysis will be performed by National Environmental Testing, Inc. (formerly Century Laboratories) of Thorofare, New Jersey and Environmental Testing & Certification of Edison, New Jersey. Both laboratories are NJDEP-certified, and as such, copies of their standard operating procedures and QA/QC programs are on file with NJDEP. Field and trip blanks will be collected during each sampling event and chain of custody documentation will accompany all sample shipments. Laboratory data will be provided in Tier II format.

6.0 HEALTH AND SAFETY

Site-specific Health and Safety Plan has been utilized by Dames & Moore personnel during on-site activities. All contractors involved in site activities will be required to prepare and implement a Health and Safety Plan to protect the field investigation team from potential hazards that may be encountered during the field investigations. The objectives of the plan are achieved by assigning responsibilities, establishing personnel protection standards and mandatory safety practices and procedures, and providing for contingencies that may arise while operations are conducted at the site. The health and safety procedures will address:

- Pertinent background information, including site history and site conditions;

- Key personnel, assignment of responsibilities and strategy of compliance and implementation of the plan;

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- Assessment of on-site hazards (physical and chemical), including permissible exposure limits or recommended threshold limit values, breakdown of component job functions, and an estimate of potential employee exposure to chemical and/or physical hazards;

- Air monitoring procedures for toxic vapors and/or selection of appropriate levels of respiratory protection;

- Standard Safe Work Practices that the field staff must follow to prevent exposure to hazards;

- First aid, medical equipment, facilities, practices, and personnel;

- Personnel protective clothing, equipment, respiratory protective devices, and approval for each activity, establishment of the specific criteria to select the level of protection, the decision process to change the level of protection, and a program for the ongoing assessment of both respiratory and skin hazards;

- Work zone delineation and decontamination practices and facilities;

- Site security and procedures for controlling access to the site;

- Emergency contacts and procedures, including emergency coordinators and their responsibilities, evacuation plan for on-site personnel, list of emergency equipment and their locations, arrangements with local first aid units, fire departments, and hospitals.

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7.0 SCHEDULE

Ongoing remedial activities include efforts to close remaining open drum cells. Prior to initiating further drum removal at the fire pond and area S-5, these remaining open drum cells in Area S-6 will be backfilled. This activity at Area S-6 and the fire pond may be performed prior to final NJDEP review of this document. Remedial work in Area S-5 will not commence until NJDEP review. During this period, logistic arrangements for mobilization and sampling at other areas can be initiated. The general sequence of activities anticipated at the site is as follows:

1. Resample and backfill drum cells 1, 2, 3 and 5.

2. Prepare and initiate bench scale testing plan for soil fixation at Area S-5. This program will be documented and results submitted to NJDEP.

3A. Drum removal and excavation at fire pond.

3B. Soil sampling at Platform 7 and fire pond (if appropriate) after removal and excavation.

4. Soil removal at fuel oil tanks and sediment removal at northern catch basin.

5. After completing bench scale and pilot scale testing, prepare detailed Operations Plan and remediate Area S-5.

6. Maintain ground water monitoring program throughout period of site remediation and subsequent to completion of remedial activities.

ATTACHMENT 13

TABLE 2 (continued)

AREA S-7		
Fire Platform - Grassy area adjacent to Building 7 which was destroyed by fire.	Surficial soil composite samples revealed low levels of volatile compounds.	Advance two continuously sampled borings in area to 10-foot depths. Samples from 5 and 10 feet analyzed for priority pollutant volatile organic compounds.
AREA S-8		
Northern catch basin outside of northwest corner of fenceline.	Sediment sample contained low levels of petroleum hydrocarbons.	Remove sediment via vacuum truck and install oil boom in catch basin.
AREA S-11		
Visibly stained surficial soils around oil tanks at southwest end of Building 3.	Observed stained soil.	Remove visually stained soil for off-site disposal. If stains exist deeper than one inch, obtain post excavation samples for analysis of petroleum hydrocarbons.
AREA B		
Ground water beneath site.	A total of 9 monitoring wells installed. Ground water samples obtained in 1984, 1987 and 1988. Low levels of volatile organic compounds identified in samples.	Extend existing monitoring program to include biannual sampling for volatile organics and base/neutral organics with library searches, pH and TDS. Program to extend throughout and subsequent to period of site remedial activities.

NOTES:

1. Refer to text for description of areas and proposed remedial actions.
2. Refer to Figure 2 for location of areas.

ATTACHMENT B

TABLE 3

SUMMARY OF PRIORITY POLLUTANT ANALYSES
DRUM CELL NO. 1 SIDEWALL SAMPLES
ADRON/PPF FACILITY
EAST HANOVER, NEW JERSEY

Dames & Moore I.D.:	Cell 1 SW-1	Cell 1 SW-2	Cell 1 SW-3	Cell 1 SW-4	Cell 1 SW-5	Cell 1 SW-6
Laboratory I.D.:	6545	6543	6541	6537	6539	6546
Petroleum Hydrocarbons (mg/kg)	130	48	52	39	63	290
Volatile Organics (ug/kg)						
Methylene Chloride	3	4	8	7	12	ND
Extractables (ug/kg)						
Bis(2-ethylhexyl) phthalate	ND	ND	BMDL	ND	ND	ND
Metals (mg/kg)						
Cadmium	1.86	2.02	1.83	1.72	2.57	1.91
Chromium	14.70	14.40	15.10	17.00	22.20	19.80
Copper	27.0	32.60	33.20	19.90	21.10	30.40
Nickel	18.20	20.20	20.60	14.30	17.10	19.80
Zinc	61.70	45.20	50.60	77.00	44.50	119.00
Arsenic	2.56	1.80	3.21	3.20	2.81	2.39
Lead	34.20	21.40	22.40	36.20	40.00	35.10
Thallium	1.33	1.70	2.60	ND	ND	ND
Mercury	.466	1.75	.664	.534	.138	1.044
PCBs (ug/kg)	ND	ND	ND	ND	ND	ND
Cyanide (ug/kg)	ND	ND	ND	200	100	200
Phenols (ug/kg)	7,700	ND	10,000	ND	ND	ND

NOTES:

mg/kg = parts per million

ug/kg = parts per billion

ND = Not Detected

Only those compounds detected are included on table.
Samples analyzed for PP +40.

Refer to Figure 5 for sample locations.

ATTACHMENT 3

TABLE 4

SUMMARY OF PRIORITY POLLUTANT ANALYSIS
DRUM CELL NO. 1 BOTTOM SAMPLES
ADRON/PPF FACILITY
EAST HANOVER, NEW JERSEY

Dames & Moore I.D.:	Cell 1 B-1	Cell 1 B-2	Cell 1 B-3	Cell 1 B-4
Laboratory I.D.:	6544	6542	6540	6538
Petroleum Hydrocarbons (mg/kg)	90	160	230	146
Volatile Organics (ug/kg)				
Methylene Chloride	ND	11	11	24
1,3-Dichlorobenzene	ND	ND	4	ND
Extractables (ug/kg)				
Bis(2-ethylhexyl) phthalate	6,800	100,000	24,000	ND
Metals (mg/kg)				
Cadmium	1.18	1.33	1.2	2.78
Chromium	8.82	9.77	6.78	20.7
Copper	23.4	25.3	18.3	40.5
Nickel	14.6	15.3	10.6	24.6
Zinc	37.6	34.8	35.2	137.0
Arsenic	1.72	2.0	1.58	6.62
Lead	13.1	16.9	15.6	63.9
Thallium	1.6	2.0	ND	ND
Mercury	.280	.246	ND	.662
PCBs (ug/kg)	ND	ND	ND	ND
Cyanide (ug/kg)	ND	ND	100	170
Phenols (ug/kg)	1,900	1,700	ND	ND

NOTES:

mg/kg = parts per million

ug/kg = parts per billion

ND = Not Detected

Only those priority pollutant compounds detected are included on table.
Samples analyzed for PP +40.

Refer to Figure 5 for sample locations.

ATTACHMENT B

TABLE 5

SUMMARY OF PRIORITY POLLUTANT ANALYSIS
DRUM CELL NO. 5 BOTTOM SAMPLES
ADRON/PPF FACILITY
EAST HANOVER, NEW JERSEY

Dames & Moore I.D.:	Cell 5 B-1	Cell 5 B-2	Cell 5 B-3	Cell 5 B-4
Laboratory I.D.:	6529	6530	6533	6534
Petroleum Hydrocarbons (mg/kg)	1,200	1,200	29	41
Volatile Organics (ug/kg)				
Methylene Chloride	6	7	ND	14
Extractables (ug/kg)				
Bis(2-ethylhexyl) phthalate	1,100	2,900	ND	510
Metals (mg/kg)				
Cadmium	3.22	1.72	1.93	1.31
Chromium	21.20	19.80	22.60	12.90
Copper	31.20	27.90	35.00	31.10
Nickel	24.00	22.30	26.20	20.60
Zinc	50.00	47.00	54.10	51.50
Arsenic	3.24	3.43	4.14	3.07
Lead	12.00	11.80	12.4	9.42
Mercury	.160	.107	.552	.669
PCBs (ug/kg)	ND	ND	ND	ND
Cyanide (ug/kg)	ND	ND	ND	ND
Phenols (ug/kg)	ND	ND	ND	1,400

NOTES:

mg/kg = parts per million

ug/kg = parts per billion

ND = Not Detected

Only those priority pollutant compounds detected are included on table.
Samples analyzed for PP +40.

Refer to Figure 5 for sample locations.

ATTACHMENT B

TABLE 6

SUMMARY OF PRIORITY POLLUTANT ANALYSIS
DRUM CELL NO. 5 SIDEWALL SAMPLES
ADRON/PPF FACILITY
EAST HANOVER, NEW JERSEY

Dames & Moore I.D.:	Cell 5 SW-1	Cell 5 SW-2	Cell 5 SW-3	Cell 5 SW-4	Cell 5 SW-5
Laboratory I.D.:	6528	6532	6536	6535	6531
Petroleum Hydrocarbons (mg/kg)	1,200	73	52	46	970
Volatile Organics (ug/kg)					
Methylene chloride	19	ND	10	14	30
Extractables (ug/kg)					
Bis(2-ethylhexyl) phthalate	BMDL	1,900	3,200	ND	ND
Metals (mg/kg)					
Cadmium	2.86	1.52	1.28	1.65	1.43
Chromium	18.0	18.4	12.8	21.9	16.2
Copper	32.1	25.2	32.3	27.8	27.4
Nickel	27.7	20.2	17.4	19.8	17.6
Zinc	48.9	43.8	39.4	48.1	40.0
Arsenic	2.96	3.26	2.29	4.01	3.09
Lead	10.6	10.4	8.70	14.6	8.09
Mercury	ND	ND	ND	.458	.119
PCBs (ug/kg)	ND	ND	ND	ND	ND
Cyanide (ug/kg)	ND	120	ND	ND	ND
Phenols (ug/kg)	ND	ND	ND	ND	ND

NOTES:

mg/kg = parts per million

ug/kg = parts per billion

ND = Not Detected

Only those priority pollutant compounds detected are included on table.
Samples analyzed for PP +40.

Refer to Figure 5 for sample locations.

ATTACHMENT B

TABLE 1

SUMMARY OF PRIORITY POLLUTANT ANALYSIS

GROUND WATER SAMPLES OBTAINED MAY 1988

ADRON/PPF FACILITY

EAST HANOVER, NEW JERSEY

D&M Sample I.D.:	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	FB-1
ETC Sample I.D.:	BE3946	BE3949	BE3948	BE3947	BE3951	BE3950	BE3945	BE3953	BE3952	BE3954
Date Sampled:	5/16/88	5/17/88	5/17/88	5/17/88	5/16/88	5/16/88	5/16/88	5/17/88	5/16/88	5/16/88
Parameters										
Volatile Organics (ug/l)										
Carbon Tetrachloride	7.26	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	15.34	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	9.43	8.54	ND	ND	ND	ND
1,2-Dichloroethane	17.0	ND	ND	15.1	ND	ND	ND	7.95	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND	44.5	ND	ND	ND	ND	ND
Methylene Chloride	15.5	ND	ND	ND	ND	ND	19.9	ND	12.2	ND
1,2-Trans-dichloroethylene	ND	22.95	ND	ND	7.47	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	677	4.04	ND	ND	4.35	ND
Trichloroethylene	ND	252.01	ND	ND	165	ND	6.89	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND	6.78 BMDL	ND	ND	BMDL	ND
Base/Neutral Compounds										
1,2-Dichlorobenzene (ug/l)	ND	ND	ND	ND	ND	ND	2.26	BMDL	ND	ND
Total Dissolved Solids (mg/l)	660	490	810	510	530	470	560	600	620	10 BMDL

NOTES:

Samples obtained May 16 and 17, 1988.

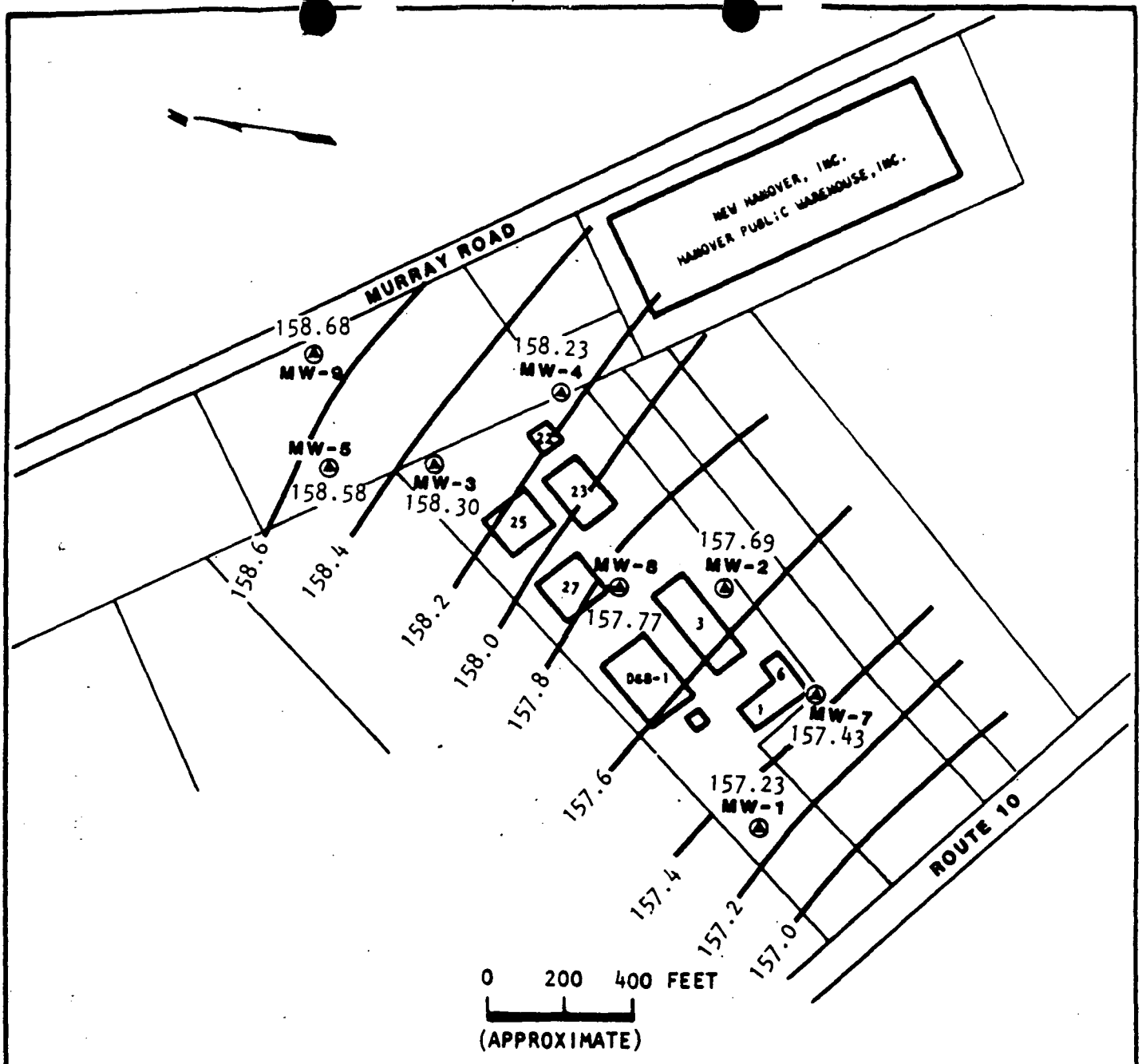
Data are reported in parts per billion.

Samples analyzed for priority pollutant volatiles and base/neutral compounds with forward library search

Only those compounds detected are shown on table

ND = Not Detected
BMDL = Below Method Detection Limits

Refer to Figure 2 for well locations and Appendix A for well construction details



GROUND WATER ELEVATION CONTOUR MAP

ADRON - EAST HANOVER, N.J.

KEY:

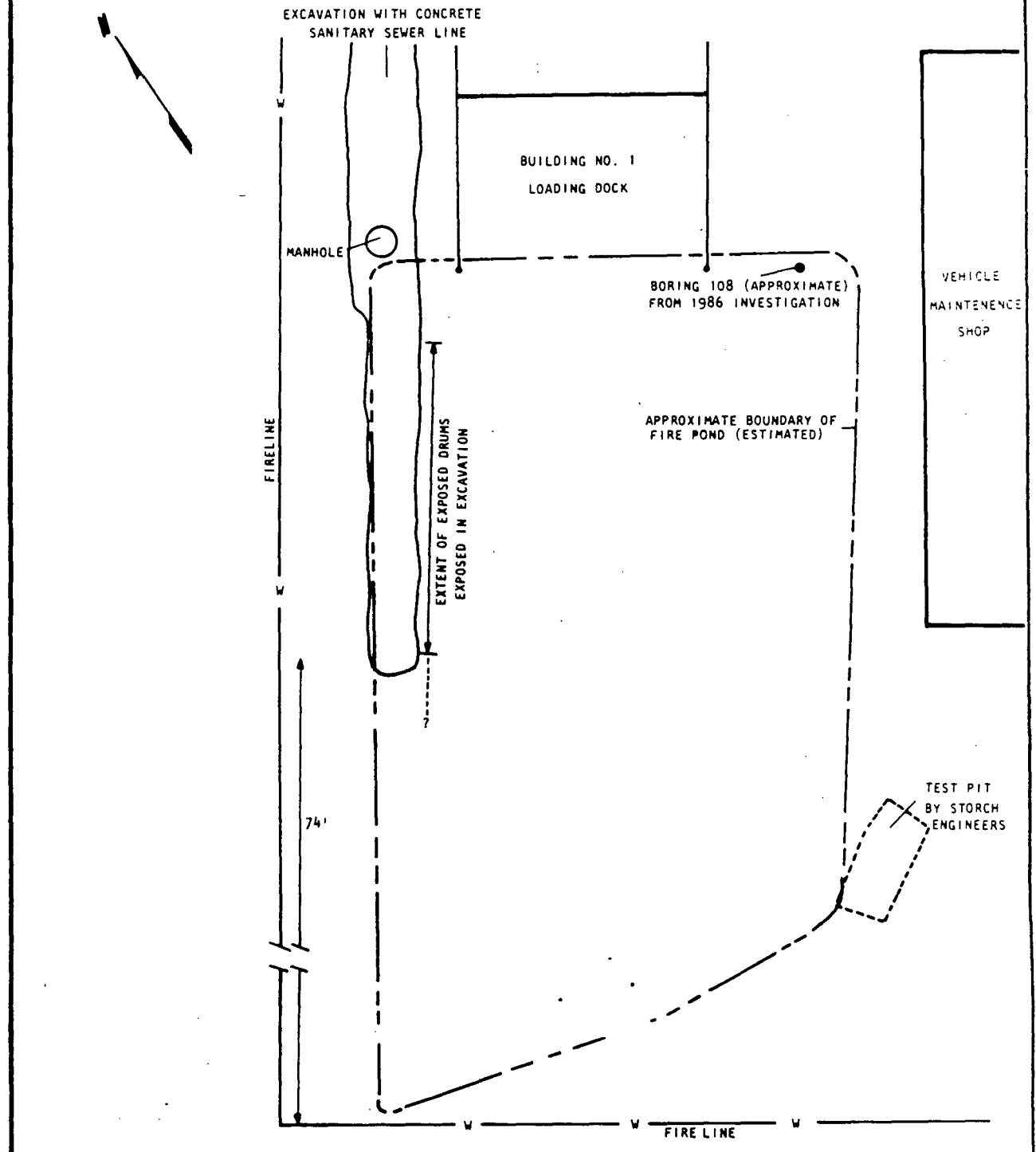
▲ MONITORING WELL

157.8 —— GROUND WATER EQUAL ELEVATION CONTOUR LINE

157.69 WATER LEVEL MEASUREMENTS OBTAINED ON 5/16/88

ATTACHMENT B

DAMES & MOORE



AREA S-3
APPROXIMATE LOCATION OF FIRE POND
ADRON/PPF FACILITY
EAST HANOVER, NEW JERSEY

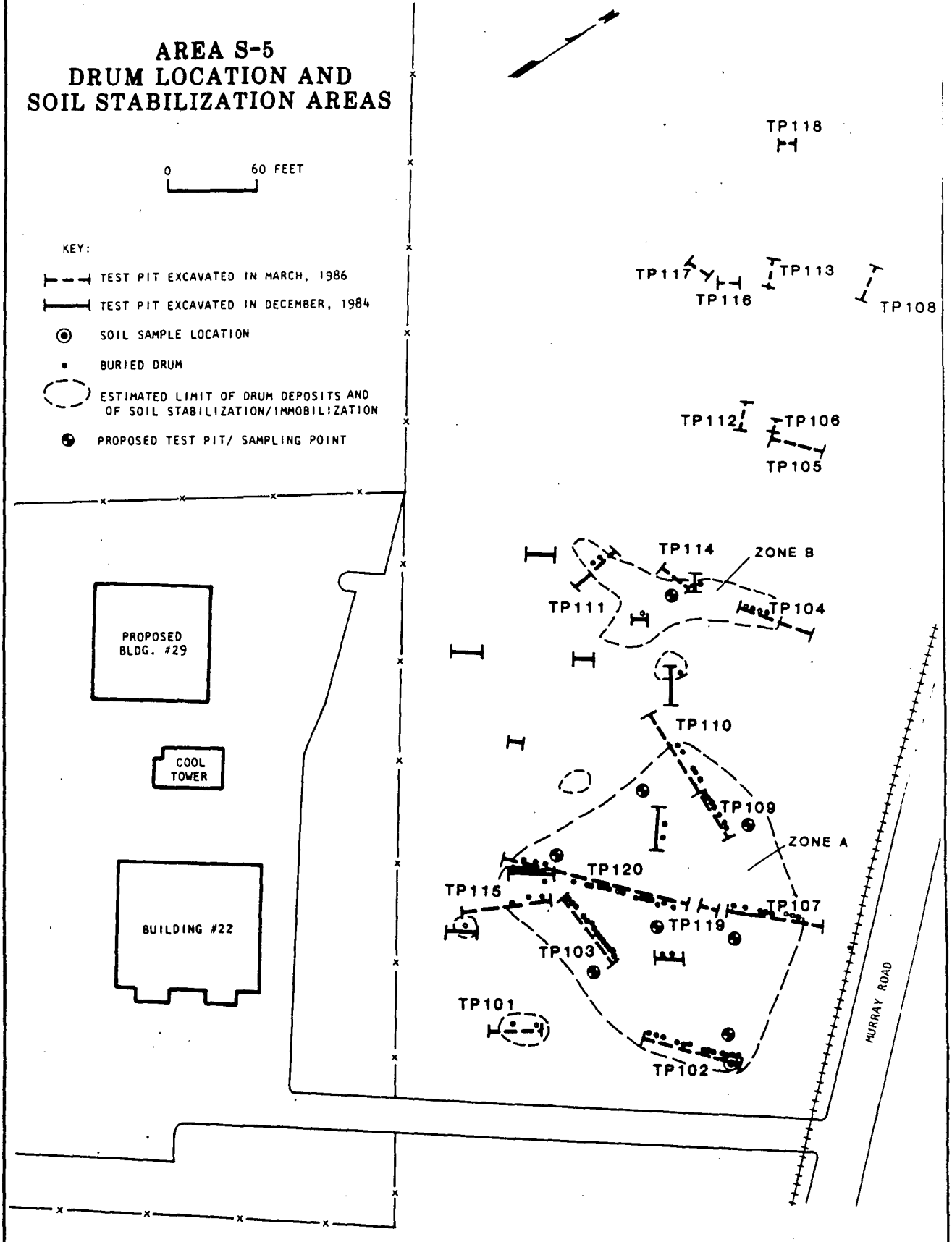
ATTACHMENT B

NOTE: REFER TO FIGURE 2 FOR AREA LOCATION.

DAMES & MOORE

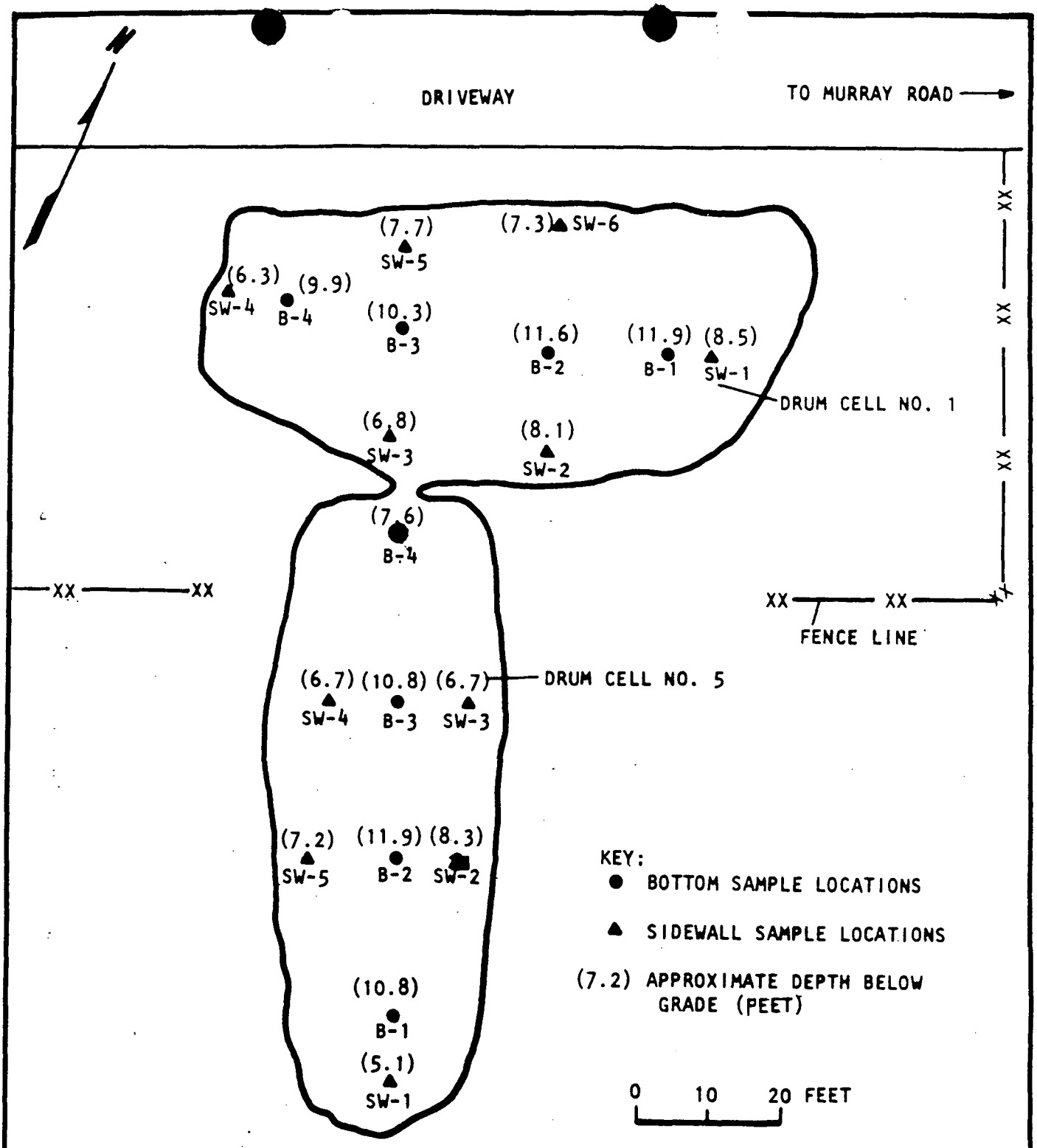
FIGURE 4

AREA S-5
DRUM LOCATION AND SOIL STABILIZATION AREAS



ATTACHMENT B.

FIGURE 5



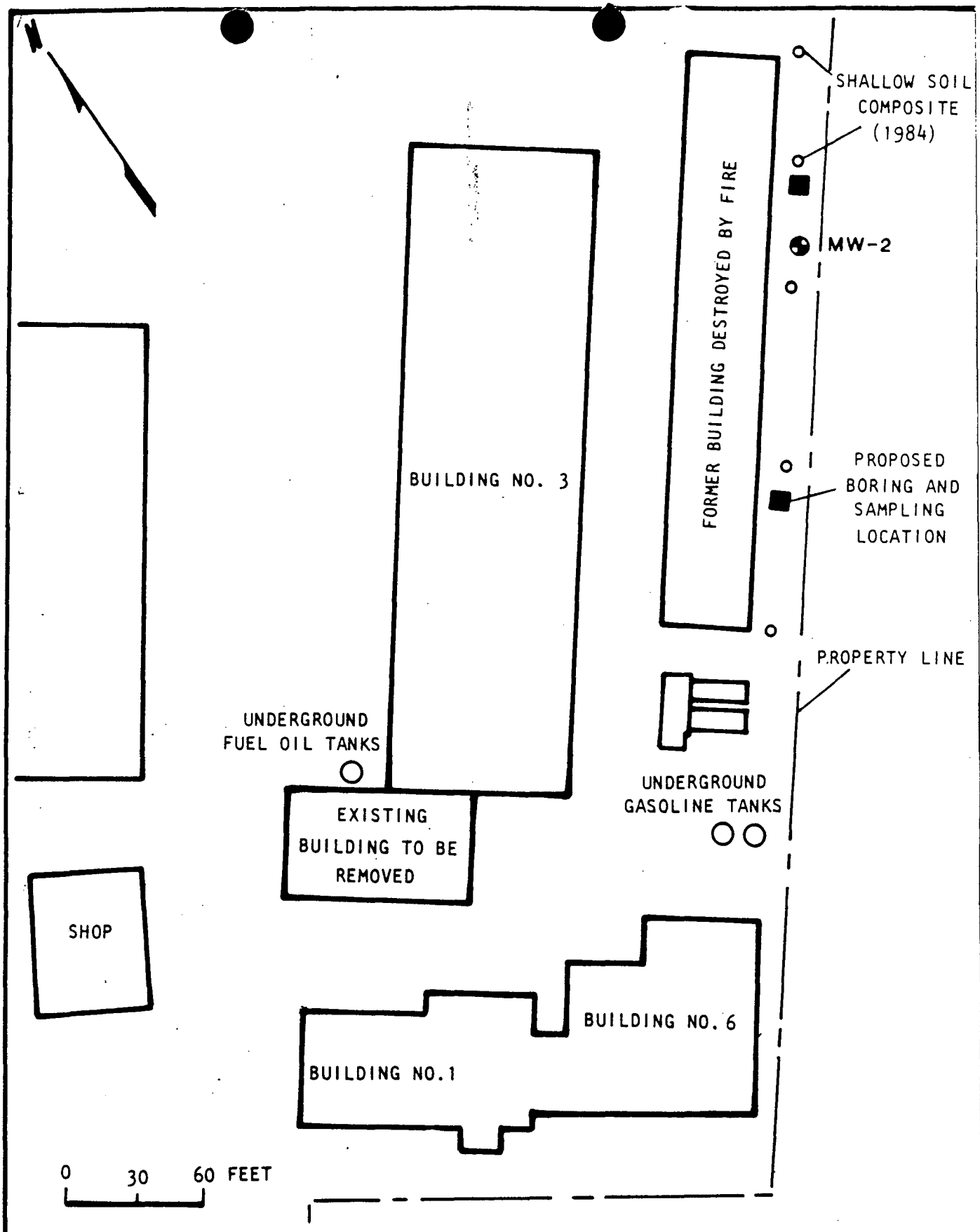
AREA S-6
DRUM CELLS NOS. 1 AND 5
SAMPLING POINT LOCATIONS

ADRON/PPF FACILITY
EAST HANOVER, NEW JERSEY

ATTACHMENT B

DAMES & MOORE

FIGURE 6

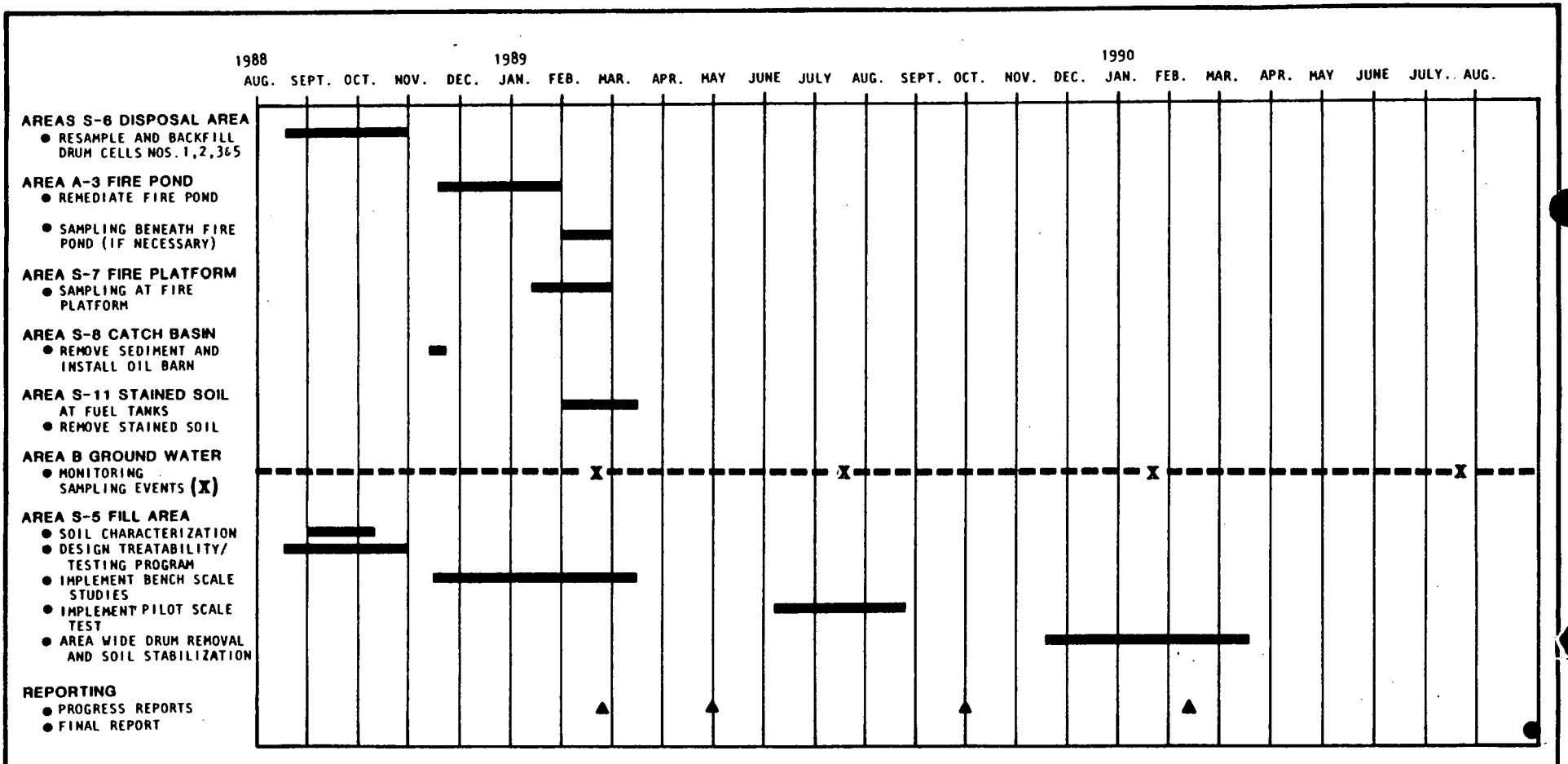


AREA S-7 FIRE PLATFORM
PROPOSED BORING AND SAMPLING LOCATIONS
ADRON/PPF FACILITY
EAST HANOVER, NEW JERSEY

ATTACHMENT B

DAMES & MOORE

FIGURE 7



PROJECTED SCHEDULE
ECRA CLEAN UP PLAN
ADRON/PPF FACILITY
EAST HANOVER, N.J.

NOTE: AREA 6 WILL BE BACKFILLED
PRIOR TO INITIATING REMEDIATION AT FIRE POND
IAL W ARE, WILL TIATI ER NJ VIEW

ATTACHMENT 13

SUMMARY OF SALIENT CORRESPONDENCE
ECRA AND CLEANUP ACTIVITIES
ADRON/PPF FACILITY
EAST HANOVER, NEW JERSEY

Date	Event/Submittal	Results and Conclusions
November 7, 1984	Dames & Moore Report "Geohydrologic Investigation and Consultation, Norda, Inc. Manufacturing Facility, East Hanover, New Jersey"	Site Geology Evaluated Magnetometer survey performed to assess location of buried drums, 5 monitoring wells installed and sampled, conceptual cleanup strategy and drum removal plan presented
April 9, 1985	Laboratory data of Initial Sampling submitted to NJDEP	State initiates review of data.
April 22, 1985	NJDEP Site Inspection	NJDEP reviews site conditions and identifies areas of concern.
May 22, 1985	NJDEP letter to Norda	Offers comments on sampling strategy and identifies areas of concern at site.
August 14, 1985	ECRA Sampling Plan submittal to NJDEP by Dames & Moore includes post drum removal sampling plan	Investigation methods at areas of concern identified.
September 20, 1985	Drum Removal Work Plan submitted to NJDEP by Adron	Presents drum removal methodology.
November 4, 1985	NJDEP letter to Adron with comments concerning Sampling Plan and Removal Plan	Minor revisions to plans requested by NJDEP.
November 21, 1985	Adron representative responds to NJDEP November 4 letters	Approach to Sampling Plan and Drum Removal finalized.
December 5, 1985	NJDEP letter approval of ECRA Sampling Plan	Sampling Plan authorized.
December 16, 1985	Dames & Moore submits report "Drum Area Geotechnical Investigation, Flavors & Fragrance Manufacturing Facility, East Hanover, New Jersey"	Drum cells are located in clayey soils with low permeabilities.
January 6, 1986	Drum removal activities initiated at Area S-6 (Drum Cells 1 through 5)	Site remediation efforts implemented as required and approved.

ATTACHMENT ____

March 4, 1986	Dames & Moore submits initial data from ECRA Sampling Plan implementation to NJDEP	NJDEP initiates data review.
April 7, 1986	Dames & Moore submits Post Excavation Report "Soil Sampling Results and Cleanup Plan Recommendations, Cell No. 4 Excavation, PPF/Norda Facility, East Hanover, New Jersey"	Hot spots in Cell No. 4 excavation with residual volatile and base/netural compounds identified. Attenuation of residuals with depth beneath excavation is illustrated.
May 5, 1986	Dames & Moore submits report to NJDEP "ECRA Sampling Plan Results, PPF/Norda Facility, East Hanover, New Jersey, ECRA Case No. 84294 for Adron, Inc."	ECRA Sampling Plan completed as approved. Recommendations for additional investigation and continued remediation at Areas S-5 (Fill Area), S-6 (Drum Cells), S-7 (Fire Platform), S-8 (Catch Basin), S-11 (Fuel Oil Stains), B (Ground Water). Other areas not recommended for additional investigation.
May 19, 1986	Dames & Moore submits report of post excavation sampling "Soil Sampling Results and Cleanup Plan Recommendations, Cell Nos. 2 and 3 Excavation, PPF/Norda Facility, East Hanover, New Jersey for Adron, Inc.	Trace levels of residual compounds identified at one hot spot in excavation. Recommendations for closing the excavation are presented.
June 5, 1986	NJDEP letter with comments concerning Drum Cell No. 4 data	Technical issues concerning Drum Cell No. 4 sampling raised.
June 30, 1986	Dames & Moore submits letter response to NJDEP June 5 letter concerning Drum Cell No. 4 soil sampling	Technical resolution of issues presented.
July 23, 1986	NJDEP letter with comments concerning ECRA Sampling Plan Report	Requests clarification of ECRA plan sampling, offers suggestions for proposed sampling, and approves no need for additional investigation at selected previously identified areas of concern.
July 31, 1986	Meeting in Trenton with NJDEP, Dames & Moore and Adron	Review project status, resolve technical issues at Cell No. 4, agree to future post excavation sampling strategy and Attenuation Study at Drum Cell No. 4.
August 28, 1986	Dames & Moore submits meeting notes of July 31 to NJDEP	Summarizes results of July 31 meeting and presents final methods for Drum Cell No. 4 Attenuation Study.

ATTACHMENT 13

September 29, 1986	Dames & Moore submits letter response to NJDEP July 23 letter concerning ECRA Sampling Plan results	Provides clarification of issues raised by NJDEP. Activities were performed in accordance with the approved Sampling Plan. Areas which need further investigation/cleanup are Fire Pond, Fire Pond Drum Cell, Open Drum Cells, Fill Area, Fire Platform, Fuel Oil Stains, Ground Water Monitoring.
October 2, 1986	NJDEP letter concerning Attenuation Study proposed on September 29	Approves proposed Attenuation Study in Drum Cell No. 4.
December 19, 1986	NJDEP letter response to Dames & Moore's September 29 letter	Requests additional discussion of issues related to Sampling Plan and additional ground water monitoring.
January 16, 1987	Dames & Moore's letter response to NJDEP's December 19 letter	A new monitoring well is proposed and additional ground water sampling implemented.
April 29, 1987	Dames & Moore letter submittal of Ground Water Sampling and Attenuation Study Progress Report	Apprised NJDEP of project status.
June 22, 1987	Dames & Moore letter report "Attenuation Study and Cleanup Plan Recommendations, Drum Cell No. 4"	Transmitted results and summarized Cell No. 4 sampling activities, notified NJDEP of closure activities of Drum Cell No. 4 and reviews drum cell investigations, transmitted ground water monitoring data.
August 17, 1987	Dames & Moore letter to NJDEP	Confirms recommendations of June 22 letter and provides notification of Drum Cell No. 4 closure.
September 28, 1987	NJDEP letter concerning August 17 letter	Approves closure activities at Cell No. 4 with minor revisions.
October 27, 1987	NJDEP letter requesting two additional monitoring wells and new round of ground water sampling	NJDEP geologist requests expanded ground water monitoring.
November & December 1987	Additional sampling and soil removal at Drum Cell No. 4 performed	Additional remedial work performed as per NJDEP September 28 letter revised to meet field conditions. Drum Cell No. 4 backfilled.

ATTACHMENT B

March 10, 1988	Dames & Moore submits Progress Report concerning new well installation, Drum Cell No. 4 closure and post excavation sampling/closure of remaining drum cells and fire pond drum cell	Describes recently completed and proposed activities on site, including installation of three new monitoring wells.
March 24, 1988	Letter from NJDEP requesting Cleanup Plan and results of ground water sampling	New NJDEP case management anxious to complete next phase of activities and receive a new Cleanup Plan.
March 30, 1988	Dames & Moore letter to NJDEP	Identifies status and apprises NJDEP of well drilling and sampling activities in Drum Cells Nos 1 and 5.

ATTACHMENT 13

APPENDIX C

SUMMARY OF DATA FROM ECRA SAMPLING PLAN RESULTS

ORIGINALLY SUMBITTED IN MAY 5, 1986 REPORT

"ECRA Sampling Plan Results
PPF/Norda Facility
East Hanover, New Jersey
ECRA Case No. 84294
For Adron, Inc."

ATTACHMENT B

TABLE 1

ECRA SAMPLING PLAN

SAMPLE SUMMARY

ADRON, INC.

EAST HANOVER, NEW JERSEY

Sample Point Identification	Area Designation	Sample Description	Sample Location
Field Blank		Water Sample for Quality Assurance	Collected at Boring 108
SB 10153	Area S-1	Soil Sample at Sump Bldg. 25	Boring 101, 12-13 ft. below grade
SB 10253	Area S-1	Soil Sample at Sump Bldg. 22	Boring 102, 9½-10 ft. below grade
SB 10354	Area S-2	Soil Sample at Septic Tank Bldg 3	Boring 103, 6-8 ft. below grade
SB 10454	Area S-1	Soil Sample at Sump Bldg. 27	Boring 104, 9-9½ ft. below grade
B104	Area S-2	Soil Sample for Septic Bldgs. 23, 25 and 27	Boring 104, 18-20 ft. below grade
S-22	Area S-2	Soil Sample for Septic Bldgs. D and B-1 and Vehicle Maintenance Bldg.	Boring 105, 42-44 ft. below grade
B10689	Area S-2	Soil Sample for Septic Bldg. #1	Boring 106, 16-18 ft. below grade
B 107 -S19	Area S-2	Soil Sample for Septic Bldgs. D and B-1	Boring 107, 36-38 ft. below grade
B 108 -S5	Area S-3	Soil Sample from Fire Pond	Boring 108, 9-10 ft. below grade
DRC	Area S-4	Soil Sample from Drum Cleaning Area	Drum Cleaning Area northeast of Bldg 22, 2 ft. below grade
SDUM	Area S-9	Soil Sample Below Southern End of Dumpster	Dumpster northwest of Bldg 22
NDUM	Area S-9	Soil Sample Below Northern End of the Dumpster	Dumpster northwest of Bldg 22
SCB	Area S-8	Soil/Sediment Sample from Catch Basin	Catch basin north of vehicle Vehicle Maintenance Bldg along western plant boundary
VM	Area S-10	Soil/Sediment Sample from Catch Basin at Vehicle Maintenance Bldg	Catch basin at southern end of Vehicle Maintenance Bldg.
NCB	Area S-8	Soil/Sediment Sample from Catch Basin	Catch basin north of fence corner at northwest corner of plant
SLAWN	Area A	Soil Sample	Grassy area near southern entrance to plant.
RSTRM	Area S-5	Water Sample from Stream/Seep	Seep entering wooded area northwest of MW-5.
TP102	Area S-6	Soil Sample	Test Pit 102 8 feet below grade.

NOTES:

1. Refer to Figure 2, 8, 9 and 10 for sample locations.
2. Refer to Tables 2, 3 and 4 for results of chemical analysis.

ATTACHMENT 13

TABLE 2

SUMMARY OF ANALYSES

ECRA SAMPLING

AREA DESIGNATIONS S-1, S-2 AND S-3

ADRON, EAST HANOVER, NEW JERSEY

	AREA DESIGNATION								
	S-1	S-1	S-2	S-1	S-2	S-2	S-2	S-2	S-3
	SAMPLE IDENTIFICATION								
	Field Blank	SB101S3	SB102S3	SB103S4	SB104S4	B104S9	S-22	B106S9	B107-S19	B108-S5
Priority Pollutant Volatile Compounds										
Benzene										134
Ethylbenzene										229
Methylene Chloride	21.6		18.0	143		159	162	193	BMDL	171
Toluene					62.5				BMDL	3,110
Tentatively Identified Volatile Compounds										
Unknown			•(1)							
Unknown		•(1)								
Unknown				•(1)						
Unknown					•					
Cyclohexene, 1-methyl-4-(1-methylethenyl)					•					
Carbon dioxide						•(1)	•(1)	•(1)	•(1)	
4 Unknowns						•				
Alkane						•				
2-Propanone								•	•	•
4 Unknowns										•
1,3,3-trimethyl-2-oxabicyclo (2.2.2.) octane										•
1,3,3-trimethyl-bicyclo (2.2.1) heptan-2-one										•
1,7,7-trimethyl-bicyclo (2.2.1) heptan-2-one										•
3,3,5-trimethylcyclo hexanone										•

NOTES:

1. Concentrations are in ug/kg (parts per billion).
2. Blank space indicates compound not detected in that sample.
3. • denotes compound tentatively identified in library search.
4. •(1) denotes compound also detected in blank.
5. Samples analyzed for priority pollutant volatile compounds with "Plus 15" library search.
6. Refer to Table 1 for sample description.
7. Refer to Figures 2, 8, 9 and 10 for sample locations.

ATTACHMENT B

TABLE 3

SUMMARY OF ANALYSES

ECRA SAMPLING PLAN

AREA DESIGNATIONS S-4, S-8, S-9 AND S-10

	AREA DESIGNATION					
	S-4	S-9	S-9	S-8	S-8	S-10
	SAMPLE IDENTIFICATION					
	DRCL	SDUM	NDUM	SCB	NCB	VM
Priority Pollutant Volatile Compounds						
Methylene Chloride	107	79.9	166	181	148	481
Toluene				BMDL		33.4
Petroleum Hydrocarbons					370 (ppm)	
Tentatively Identified Volatile Compounds						
Carbon Dioxide		•(1)	•(1)	•(1)	•(1)	•(1)
Unknown				•		
Methyl Methyl ethyl cyclohexane		•			•	
Unknown					•	

NOTES:

1. Concentrations are in ug/kg (parts per billion) unless otherwise noted.
2. Blank space indicates compound not detected in that sample.
3. • denotes compound tentatively identified in library search.
4. •(1) denotes compound also detected in blank.
5. Sample "NCB" analyzed for priority pollutant volatile compounds with "Plus 15" library search and petroleum hydrocarbons. Other samples analyzed for priority pollutant volatile compounds with "Plus 15" library search only.
6. Refer to Table 1 for sample description and location.
7. Refer to Figure 2 for sample locations.

ATTACHMENT B

TABLE 4

SUMMARY OF ANALYSES

RCRA SAMPLING PLAN

AREA DESIGNATIONS S-1, S-4, S-A

	AREA DESIGNATION		
	S-1	S-4	S-A
	SAMPLE IDENTIFICATION		
	TP-103	SETRM	SLAWN
Priority Pollutant Volatile Compounds			
Methylene Chloride	16.1	BMDL	77.7
Toluene	BMDL		
Tentatively Identified Volatile Compounds			
Carbon Dioxide	•(1)		•(1)
Tentatively Identified Acid Compounds			
Tetrachloroethene		•(1)	•(1)
Alkane	•		
6 Unknowns	•		
2 Alkanes		•(1)	
Methyl Phenol		•	
Benzene Acetic Acid		•	
Benzenepropanoic Acid		•	
8 Unknowns		•	
Hexane			•
3 Methylpentane			•(1)
Methylcyclopentane			•(1)
Cyclohexane			•(1)
3 Methyl hexane			•
3 Unknowns			•
Unknown			•(1)
Tentatively Identified Base/Neutral Compounds			
Alkane	•		
2 Unknowns	•		
4 Methyl 2-Pentanone		•	
Tetrachloroethene		•	
Alkane		•	
Alkane		•	
5 Unknowns		•	
1-Cyclopropylethanone		•	
3 Hexen-2-One		•	
Decane		•(1)	
6 Unknowns		•	
1 Unknown		•	
Cyanide and Phenols			
Phenolics, Total	.1 (ppm)	10	100
Cyanide, Total	.5 (ppm)	25	500
Priority Pollutant Metals			
Antimony	ND	ND	ND
Arsenic	3,000	ND	4,000
Beryllium	ND	ND	500
Cadmium	ND	ND	700
Chromium	30,000	ND	25,000
Copper	21,000	ND	15,000
Lead	BMDL	ND	15,000
Mercury	ND	ND	ND
Nickel	24,000	ND	17,000
Selenium	BMDL	5	ND
Silver	ND	ND	ND
Thallium	BMDL	BMDL	BMDL
Zinc	70,000	30	40,000

NOTES:

1. Concentrations are in ug/kg (parts per billion).
2. Blank space indicates compound not detected in that sample.
3. • denotes compound tentatively identified in library search.
4. •(1) denotes compound also detected in blank.
5. Samples analyzed for full priority pollutants with "Plus 40" library search.
6. Refer to Figures 3 and 11 and Appendix B for sample locations.

ATTACHMENT B

TABLE B-1

SUMMARY OF ANALYSES

GROUND WATER SAMPLES OBTAINED IN 1984

AREA DESIGNATION B

PPP/NORDA SITE

EAST HANOVER, NEW JERSEY

Parameter	ETC MW-1	NYT MW-1	ETC MW-2	ETC MW-3	NYT MW-3	ETC MW-4	NYT MW-4	ETC MW-5	NYT MW-
Priority Pollutant Volatile Organic Compounds									
Trichloroethylene	BMDL		115	BMDL	< 10			BMDL	
Toluene	BMDL	< 10			< 10		< 10		
Methylene Chloride	BMDL	25			< 10	BMDL	11	BMDL	1
1,2-Dichloroethane	47	15				51	95		
Chloroform	26	51							
Carbon Tetrachloride	30	69							
1,2-Trans-Dichloroethylene			BMDL	BMDL					
Tetrachloroethane	34			BMDL		BMDL			
1,1,1-Trichloroethane	BMDL					BMDL		24	
Chlorobenzene				BMDL					
Priority Pollutant Acid Compounds									
Pentachlorophenol					30				
Priority Pollutant Base/Neutral Compounds									
Di-n-octyl phthalate								BMDL	< 10
Diethyl phthalate				BMDL	< 10				
Bis(2-ethylhexyl) phthalate								BMDL	< 10
Metals, Cyanide and Phenols									
Antimony	BMDL	< 100			< 100		< 100		< 100
Arsenic	BMDL	< 1	BMDL	BMDL	< 4	BMDL	< 1	7.00	
Beryllium		< 3			< 3		< 3		< 3
Cadmium		< 3			< 3		< 3		< 3
Chromium		< 10			< 10		< 10	BMDL	< 10
Copper	BMDL	< 20	BMDL		< 20		< 20		< 20
Lead		< 25			< 25		< 25		< 25
Mercury		0.1			0.3		0.4		0.2
Nickel		< 20		BMDL	20	BMDL	< 20		< 20
Selenium	BMDL	1	BMDL	BMDL	< 1		3		2
Silver		< 6			< 6		< 6		< 6
Thallium		< 50	BMDL		< 50		< 50	BMDL	< 50
Zinc	BMDL	34	BMDL	7.00	24	15	8	BMDL	50
Cyanide, Total	26	< 20	< 25	< 25	< 20	< 25	< 20	< 25	< 20
Phenolics, Total	< 50	< 2	< 50	61	< 2	< 50	< 2	< 50	< 2

NOTES:

1. Concentrations are in parts per billion (ppb).
2. Results are from New York Testing Laboratories (NYT) and Environmental Testing & Certification (ETC).
3. *Tentatively identified Compounds are those identified in "Plus 40" library search. Concentrations are estimated and not integrated on the basis of injection of standard solutions.
4. Only those compounds detected are listed. Blank space indicates compounds not detected in that sample.
5. See Figure 6 for well locations.
6. Samples obtained and analyzed in 1984.

ATTACHMENT B

TABLE B-1 (continued)

TENTATIVELY IDENTIFIED AND QUANTIFIED COMPOUNDS

GROUND WATER SAMPLES OBTAINED IN 1984

AREA DESIGNATION B

PPF/NORDA SITE

EAST HANOVER, NEW JERSEY

Parameter	ETC MW-1	NYT MW-1	ETC MW-2	ETC MW-3	NYT MW-3	ETC MW-4	NYT MW-4	ETC MW-5	NYT MW-5
Tentatively Identified Volatile Compounds*									
Hexane									36
2 Propanol									19
1,1-OxyBisethane				308			1200		
Ethyl Hexanol					7				
Trimethyl Benzene					4				
1,3-Dimethyl Benzene					20		14		
2-Butanone					5		4		4
2-Propanone					310		470		1800
2,2-OxyBispropane					72				
1-1, OxyBismethane					4500				
Oxybisethane						125			
Tentatively Identified Acid Compounds*									
Cyclotetra Siloxane, Octamethyl								12	
Pentyl Cyclopropane								16	
Dodecamethyl Pentasiloxane								148	
Dodecanoic Acid								218	
3 Unknowns								40-90	
Tetra Deconoic Acid								17	
1H-Purin-6-Amine (2 Fluorophenyl) methyl								35	
Biphenylene						27			
2 Unknowns			16-41						
1,3,5,-Triazine-2,,4,6 (1H, 3H, 5H)-Trione, 1,3,5-Trimeth			16						
Tentatively Identified Base/Neutral Compounds*									
5 Unknowns						21-65			
1H-Indole, 3-phenyl-1-trimethyl silyl						1033			
Dioctylester Hexanedioic Acid						20			
5 Unknowns				15-45					
Benzoic Acid, 4-Methoxy, trimethylsilyl ester				93					
Dodecanoic Acid				23					
Hexanedioc Acid Dioctyl Ester		65		239					
Acetic Acid (aminooxy)			29						
5 Unknowns			27-143						
6 Unknowns		17-66							
1,3-Dioxolane, 2 pentadecyl		17							

NOTES:

1. Concentrations are in parts per billion (ppb).
2. Results are from New York Testing Laboratories (NYT) and Environmental Testing & Certification (ETC).
3. *Tentatively Identified Compounds are those identified in "Plus 40" library search. Concentrations are estimated and not integrated on the basis of injection of standard solutions.
4. Only those compounds detected are listed. Blank space indicates compounds not detected in that sample.
5. See Figure 6 for well locations.
6. Samples obtained and analyzed in 1984.

ATTACHMENT B

TABLE B-2

SUMMARY OF ANALYSES

COMPOSITE NO. 1 SOIL SAMPLE

AREA DESIGNATION S-7 (PLATFORM 7)

PPF/NORDA SITE

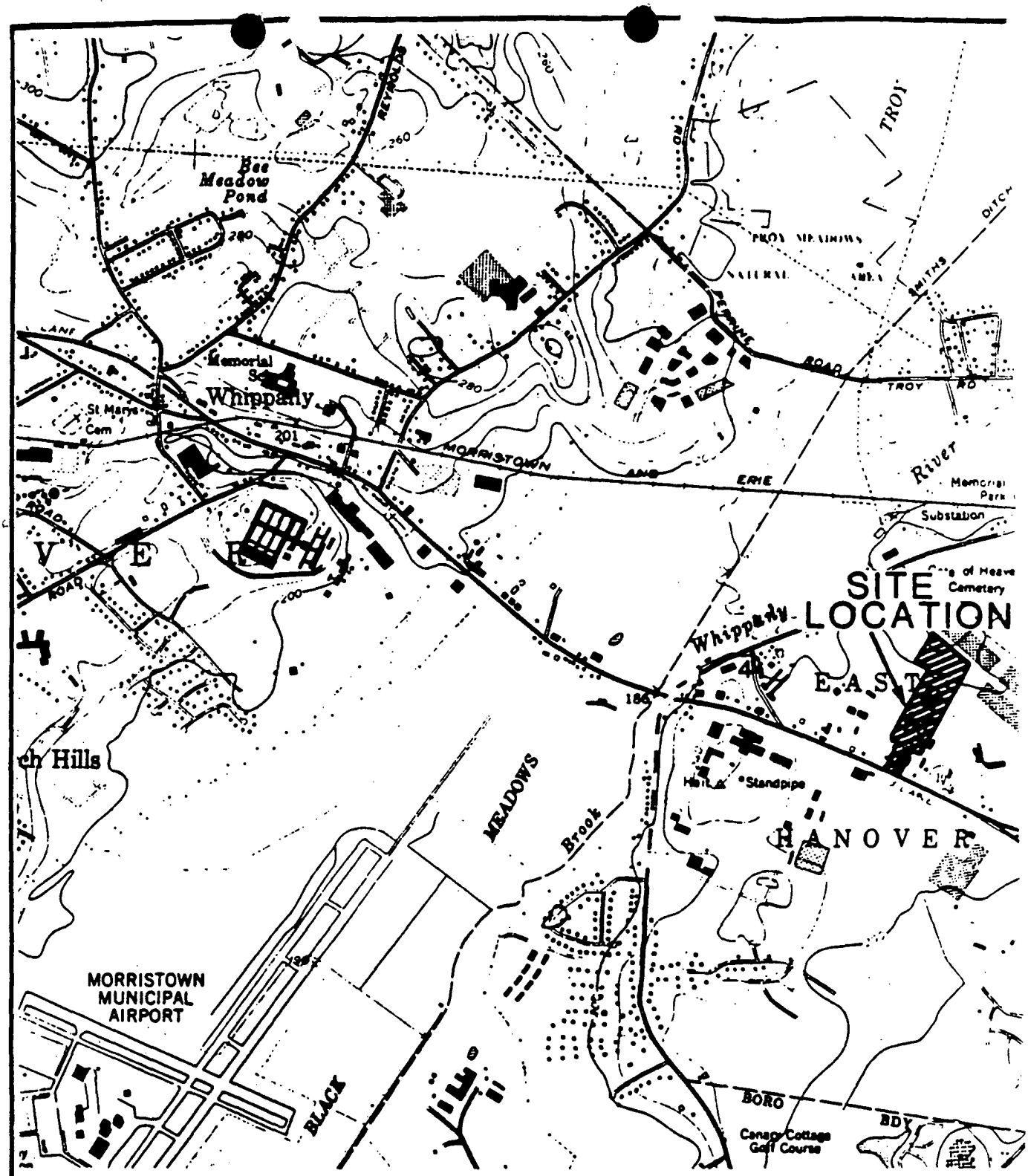
EAST HANOVER, NEW JERSEY

Parameter	Soil Composite 1	
Priority Pollutant Volatile Compounds		
Chlorobenzene	2400	
Methylene Chloride	BMDL	
Tetrachloroethylene	194	
Toluene	3230	
Priority Pollutant Base/Neutral Compounds		
Anthracene	BMDL	
Fluoranthene	BMDL	
Metals, Cyanide and Phenols		
Antimony		
Arsenic	9.30	ppm
Beryllium	1.00	ppm
Cadmium		
Chromium	31	ppm
Copper	28	ppm
Lead	42	ppm
Mercury	BMDL	
Nickel	20	ppm
Selenium	BMDL	
Silver		
Thallium	.90	ppm
Zinc	100	ppm
Cyanide, Total	< .50	ppm
Phenolics, Total	.60	ppm

NOTES:

1. Concentrations are in parts per billion (ppb) unless otherwise noted.
2. Results are from Environmental Testing & Certification (ETC).
3. Only those compounds detected are listed. Sample analyzed for full priority pollutants with "Plus 40" library search.

ATTACHMENT B

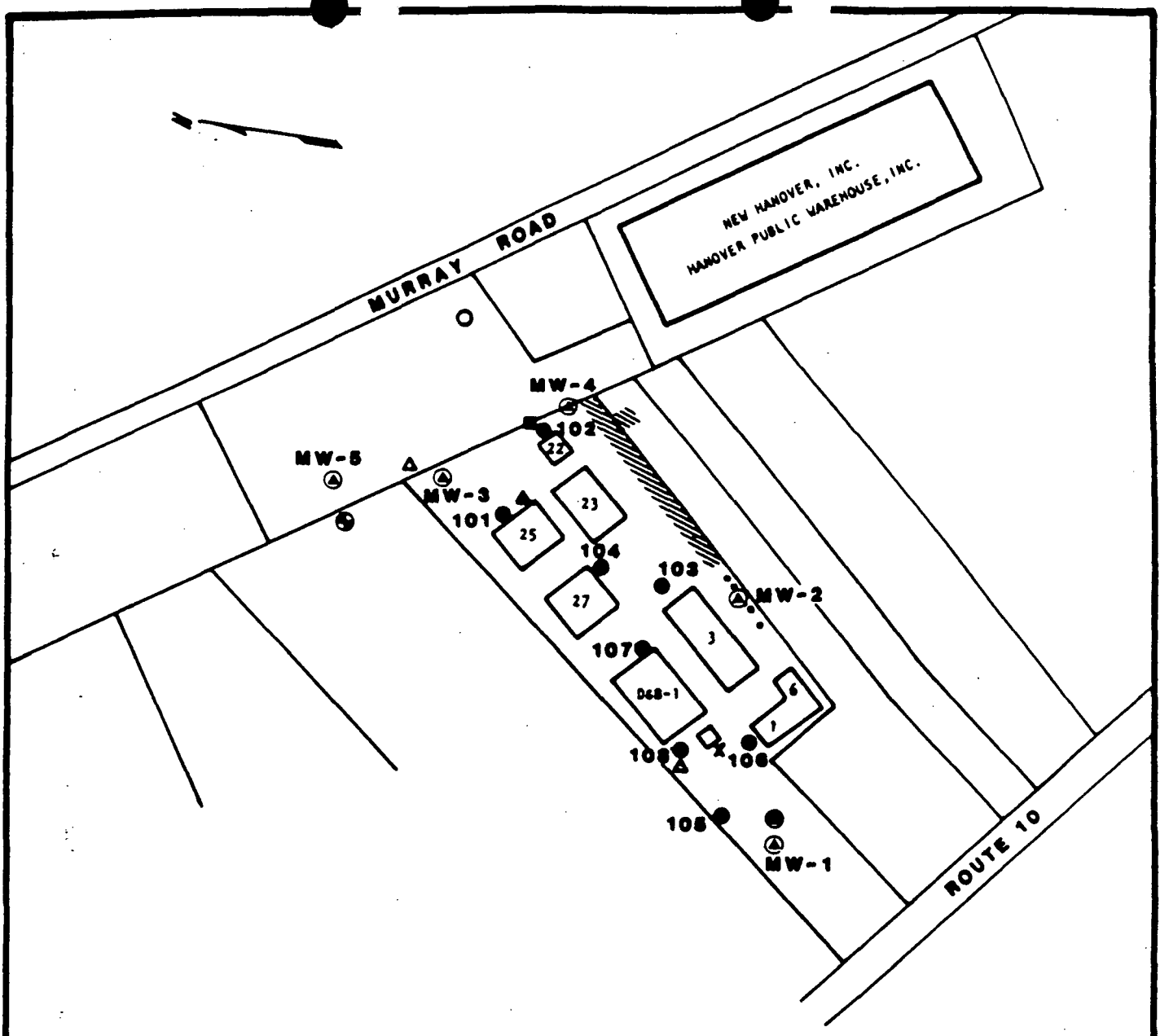


SITE LOCATION MAP

ECRA SAMPLING PLAN
ADRON - EAST HANOVER, N.J.

ATTACHMENT

MAP TAKEN FROM USGS TOPOGRAPHIC MAP,
MORRISTOWN QUADRANGLE



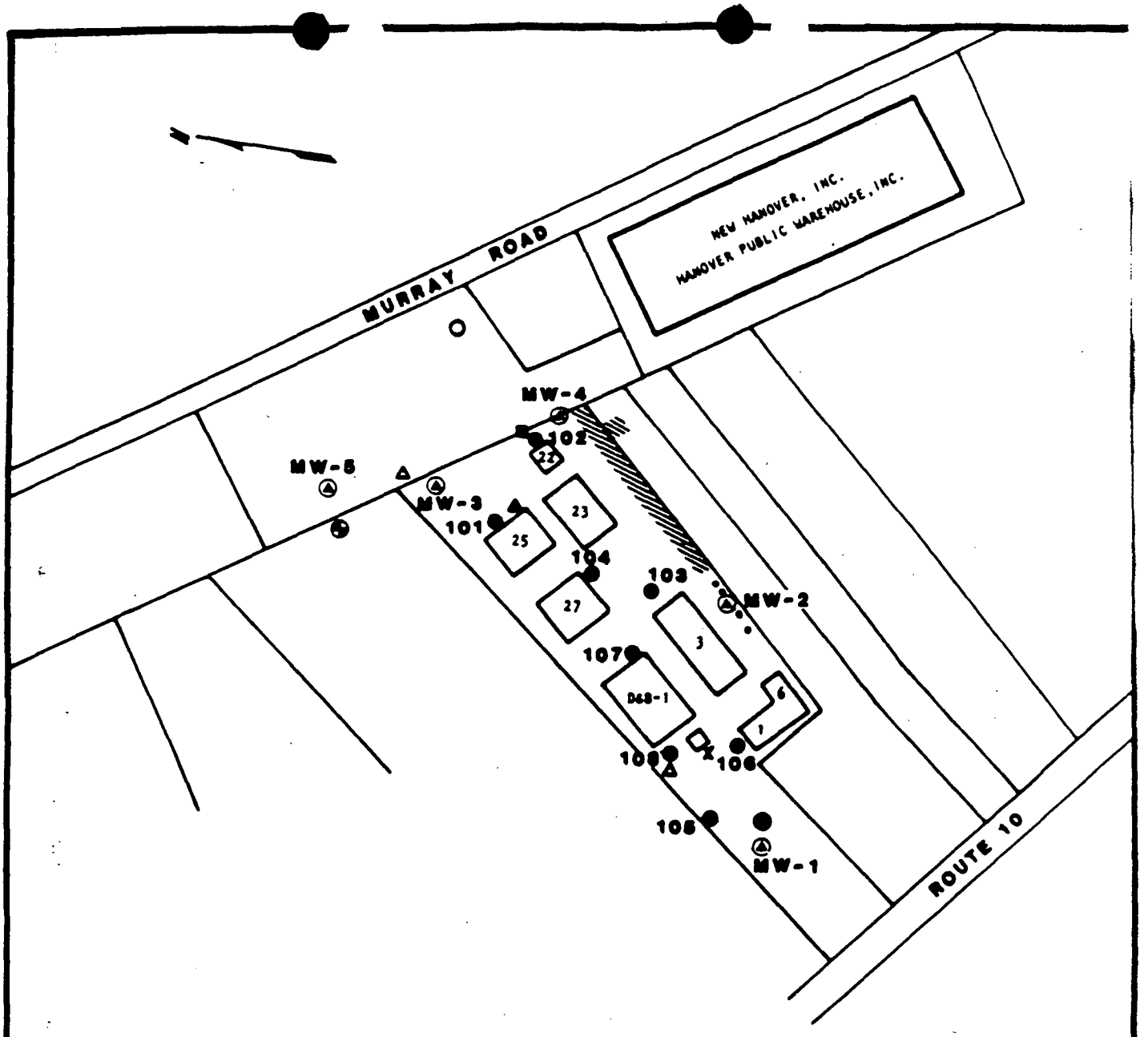
PLOT PLAN
APPROXIMATE SAMPLING POINT LOCATIONS
ECRA SAMPLING PLAN
ADRON - EAST HANOVER, N.J.

KEY:

- MONITORING WELL INSTALLED PREVIOUSLY BY DAMES & MOORE
- 108 ● BORING & SOIL SAMPLING LOCATION AT SUMPS AND SEPTICS
- x SEDIMENT SAMPLE AT VEHICLE MAINTENANCE BUILDING
- △ SEDIMENT SAMPLES AT CATCH BASINS
- ■ SOIL SAMPLE AT DRUM CLEANING AREA
- ▲ SOIL SAMPLES AT DUMPSTER
- WATER SAMPLE FROM STREAM/SEEP
- SOIL SAMPLE AT SOUTHERN PLANT ENTRANCE
- O SOIL SAMPLE AT TEST PIT 102
- DRUM DISPOSAL AREA
- •••• SOIL SAMPLES FOR COMPOSITES ALONG PLATFORM 7

ATTACHMENT B

DAMES & MOORE



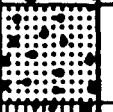
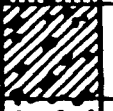
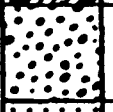
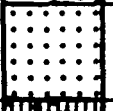
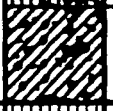
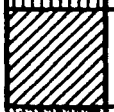
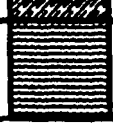
SITE PLAN
AREA DESIGNATIONS
ECRA SAMPLING PLAN
ADRON - EAST HANOVER, N.J.

K E Y:

	⊛	MONITORING WELL INSTALLED PREVIOUSLY BY DAMES & MOORE
105	●	AREAS S-1, S-2 & S-3
	■	AREA S-4
	◒	AREA S-5
	○	AREA S-5
	▨	AREA S-6
	••••	AREA S-7
	△	AREA S-8
	▲	AREA S-9
	x	AREA S-10
	●	AREA A

ATTACHMENT B

DAMES & MOORE

MAJOR DIVISIONS			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS — MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS — MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

ATTACHMENT B

DAMES & MOORE

BORING 101

SURFACE ELEVATION 204.31'

DEPTH IN FEET	SAMPLES	BLOW COUNT	SYMBOLS	DESCRIPTIONS
0				ASPHALT
		9	CL-SC	GRAY SANDY CLAY, TRACE GRAVEL (FILL)
5		8	SC	BROWN CLAYEY FINE TO COARSE SAND, TRACE FINE GRAVEL (WET) (SATURATED)
				GRAY SANDY CLAY WITH ORGANIC MATERIAL (SOFT) (WET)
10			CL	GRADING WITH SOME ORGANIC MATTER & WOOD FRAGMENTS, TRACE FINE GRAVEL & ORGANIC ODOR
		*2	SC-CL	RED CLAYEY SAND
15				1. BORING COMPLETED TO A DEPTH OF 13 FEET ON 1/6/86. 2. NO DRILLING MUD USED. 3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/6/86.

BORING 102

SURFACE ELEVATION 203.02'

DEPTH IN FEET	SAMPLES	BLOW COUNT	SYMBOLS	DESCRIPTIONS
0		7	SC	GRAY-BROWN FINE SAND WITH CLAY, TRACE FINE GRAVEL, TRACE ROOTS (MOIST) (MEDIUM DENSE)
5		1		GRADING WITH MORE CLAY
			CL	GRAY-RED MOTTLED CLAY WITH LITTLE VERY FINE SAND (VERY MOIST) (SOFT)
10		*21		GRADING WITH TRACE FINE GRAVEL (STIFF)
				1. BORING COMPLETED TO A DEPTH OF 11 FEET ON 1/6/86. 2. NO DRILLING MUD USED. 3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/6/86.
15				

BORING 103

SURFACE ELEVATION 209.99'

DEPTH IN FEET	SAMPLES	OVA	BLOW COUNT	SYMBOLS	DESCRIPTIONS
0				CL	ASPHALT
		2.5	22		GRAY-GREEN MOTTLED GRAVELLY CLAY, SOME ORGANIC MATERIAL
		4	54		TAN CLAY, SOME GRAVEL & ROOT FRAGMENTS WITH ROCK FRAGMENTS (MOIST) (STIFF)
		70	51		GRADING WITH GRAVELLY LENSES & DARKER BROWN COLOR
5		4	* 73		GRADING WITH LITTLE FINE TO MEDIUM SAND (MOIST)
		25	105	CL	
10		3	76		
		8	120		GRADING WITH SOME FINE SAND LENSES
		2	62		
15		3	108		BROWN FINE CLAYEY SAND (VERY SLIGHTLY MOIST) (DENSE)
		3	100/6"		GRADING WITH SOME FINE TO MEDIUM GRAVEL
20		6	150	SC-CL	
			100/1"		GRADING WITH COBBLES
			100/2"		
25		4	35/1"		
		4	41	SW	RED-BROWN FINE TO MEDIUM SAND, TRACE FINE GRAVEL (SLIGHTLY MOIST) (DENSE)
30		10	52		GRADING WITH GRAVEL
		8	134/8"		RED-BROWN FINE SAND, LITTLE FINE GRAVEL (SLIGHTLY MOIST) (DENSE)
35		12	100/3"		
		10	130/7"	SP	
		4	145/9"		GRADING WITH STRATIFIED FINE & COARSE SAND AND TRACE FINE GRAVEL
40		100+	155/9"		
		6	148/9"	SW	BROWN FINE TO COARSE SAND & FINE GRAVEL, TRACE CLAY (SLIGHTLY MOIST) (VERY DENSE)
		15	140/10"		BROWN FINE TO MEDIUM SAND, TRACE FINE GRAVEL (SLIGHTLY MOIST)
45		42	155/9"		GRADING WITH STRATIFIED COARSE SAND LAYERS
		18	100	SP	
					GRADING WET
50		2	75		
				GP	COARSE GRAVEL & ROCK FRAGMENTS (WET)
55					1. BORING COMPLETED TO A DEPTH OF 52 FEET ON 1/9/86. 2. NO DRILLING MUD USED. 3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/9/86.

LOG OF BORINGS

NOTES:

1. THE FIGURES IN THE COLUMN LABELED "BLOW COUNT" REFER TO THE NUMBER OF BLOWS REQUIRED TO DRIVE A STANDARD SPLIT-SPOON SAMPLER A DISTANCE OF ONE FOOT USING A 140 POUND DRIVE WEIGHT FALLING 30 INCHES. THE STANDARD SPLIT-SPOON SAMPLER IS 2" O.D. AND 1-3/8" I.D.

2. AN ASTERISK IN THE "BLOW COUNT" COLUMN INDICATES THAT THIS SAMPLE WAS DELIVERED TO THE ETC FOR CHEMICAL ANALYSIS.

3. THE FIGURES IN THE COLUMN LABELED "OVA" REFER TO THE READING OF VAPORS IN THE HEAD SPACE OF A SAMPLE JAR WHICH HAD BEEN COVERED WITH FOIL AND HEATED IN AN OVEN. READINGS MEASURED BY A FOXBORO MODEL 128 ORGANIC VAPOR ANALYZER.

ATTACHMENT B.

BORING 104

SURFACE ELEVATION 203.08'

DEPTH IN FEET	OVA	BLOW COUNT	SAMPLES	SYMBOLS	DESCRIPTIONS
0		16	S	CL	ASPHALT RED-BROWN CLAY WITH LITTLE SAND & GRAVEL (MOIST) (MEDIUM DENSE)
		28	S		
5	360	26	S	CL	GRAY-BROWN SILTY CLAY (STRONG ORGANIC ODOR)
				CL	GRAY CLAY (OIL SATURATED)
	360	+61	S		BROWN-RED CLAY, LITTLE COARSE SAND & VERY FINE GRAVEL (VERY STRONG ORGANIC ODOR)
10	340	42	S	CL	
	760	78	S		
	1000+	78	S		
15	900	54	S	SP	BROWN FINE TO MEDIUM SAND, TRACE SILT, TRACE ANGULAR GRAVEL (DRY) (DENSE) (STRONG ORGANIC ODOR)
	1000+	+76	S		STRATIFIED FINE & COARSE SAND LAYERS
20	48	62	S	SW	FINE TO COARSE SAND, LITTLE FINE GRAVEL (SLIGHT ODOR)
	89	70	S		
	66	110	S		BROWN GRAVELY MEDIUM TO COARSE SAND, TRACE SILT (DRY) (VERY DENSE)
25	84	100	S	SW-GW	
	68	61	S		(MOIST)
30	68	36	S	SP	BROWN FINE SAND, TRACE COARSE SAND & FINE GRAVEL (SLIGHTLY MOIST) (MEDIUM DENSE) (SLIGHT ODOR)
	92	50	S		
	98	58	S		GRADING WITH LENSES OF COARSE SAND
35	110	90	S		
	88	104	S	SM-GM	BROWN FINE SAND & GRAVEL, LITTLE SILT, SOME MEDIUM TO COARSE SAND (SLIGHTLY MOIST) (DENSE)
40	45	119	S	CL	BROWN CLAY (VERY SLIGHTLY MOIST) (DENSE)
	25	81	S	GW-SW	BROWN FINE TO COARSE SAND GRADING TO COARSE GRAVEL (SLIGHTLY MOIST) (VERY DENSE)
45	20	40	S	SW	BROWN-RED BROWN FINE TO MEDIUM SAND (WET) (VERY DENSE) GRADING WITH GRAVEL
50					

1. BORING COMPLETED TO A DEPTH OF 46 FEET ON 1/10/86.
2. NO DRILLING MUD USED.
3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/10/86.

BORING 105

SURFACE ELEVATION 209.26'

DEPTH IN FEET	OVA	BLOW COUNT	SAMPLES	SYMBOLS	DESCRIPTIONS
0	32	28	S	CL	ASPHALT BROWN-RED BROWN CLAY, TRACE TO LITTLE COARSE SAND & FINE GRAVEL (SLIGHTLY MOIST) (STIFF)
	56	11	S		
	72	20	S		GRADING YELLOW BROWN COLOR
5	74	26	S		
	34	38	S	CL-SC	BROWN-RED BROWN SANDY CLAY, TRACE FINE GRAVEL (SLIGHTLY MOIST) (DENSE)
10	38	85	S		GRADING WITH GRAVEL (FILL)
	16	94	S		
	50	138/11"	S	CL-SC	BROWN VERY FINE SAND & CLAY, TRACE FINE GRAVEL (MOIST) (VERY DENSE)
15	56	145/9"	S		BROWN FINE TO MEDIUM SAND, TRACE COARSE SAND & TRACE FINE GRAVEL (MOIST) (VERY DENSE)
	20	59	S	SP	GRADING WITH LITTLE COARSE SAND
20	44	57	S		GRADING STRATIFIED FINE & MEDIUM SANDS
	78	46	S		GRADING VERY MOIST
	74	64	S		BROWN FINE TO COARSE SAND & FINE GRAVEL, LITTLE FINES (MOIST) (VERY DENSE)
25	50	62	S		
	46	62	S	SW	
30	78	80	S		
	40	49	S		
	58	36	S		
35	52	39	S		BROWN VERY FINE & FINE SAND (MOIST) (DENSE)
	62	35	S	SP	GRADING WITH MEDIUM SAND & TRACE FINE GRAVEL
40	84	62	S		BROWN CLAYEY FINE TO COARSE SAND & ANGULAR FINE TO MEDIUM GRAVEL (MOIST) (VERY DENSE)
	150	+74	S	GC-SC	
45	95	71	S		
	100	61	S		
	78	78	S		BROWN FINE TO MEDIUM SAND, STRATIFIED, LITTLE FINE GRAVEL (VERY MOIST) (VERY DENSE) GRADING WITH MORE GRAVEL & SATURATED
50	44	67	S	SP	
	34	40	S		
55					

1. BORING COMPLETED TO A DEPTH OF 54 FEET ON 1/14/86.
2. NO DRILLING MUD USED.
3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/14/86.

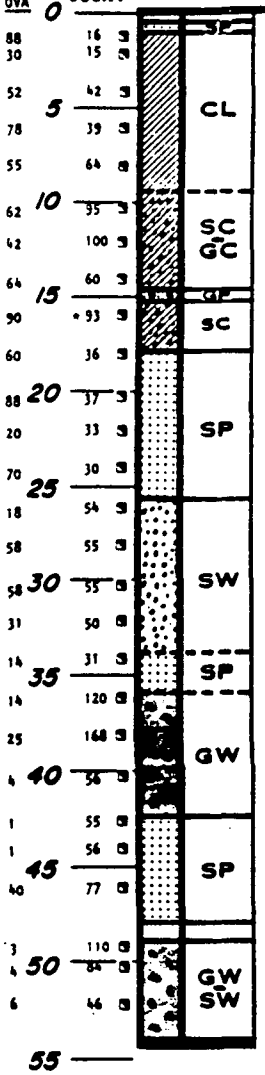
LOG OF BORINGS

ATTACHMENT B.

Dames & Moore

BORING 106

SURFACE ELEVATION 210.95'



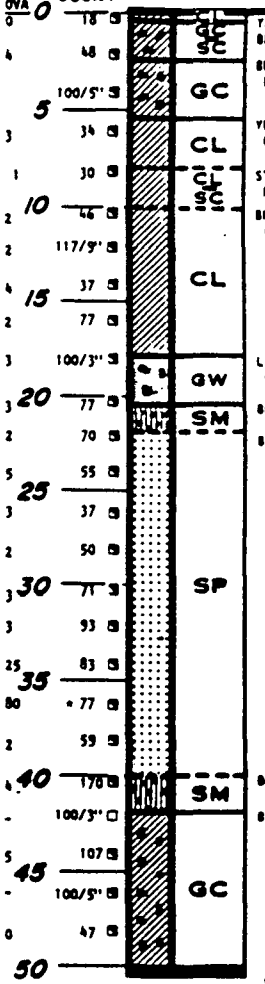
DESCRIPTIONS

- ASPHALT
- YELLOW-BROWN MEDIUM SAND (FILL)
- YELLOW-BROWN SANDY CLAY (MOIST)
- GRADING BROWN-RED BROWN CLAY, TRACE FINE SAND, TRACE FINE GRAVEL (SLIGHTLY MOIST)
- GRADING STIFF
- GRADING MORE SAND & GRAVEL (HARD)
- BROWN-RED BROWN CLAYEY FINE TO MEDIUM SAND & GRAVEL (MOIST)(VERY DENSE)
- COARSE GRAVEL
- RED-BROWN CLAYEY FINE TO COARSE SAND, SOME FINE ANGULAR GRAVEL (MOIST)(DENSE)
- BROWN-RED BROWN FINE TO MEDIUM SAND, TRACE TO LITTLE COARSE SAND & CLAY (MOIST)(DENSE)
- GRADING WITH TRACE GRAVEL & STRATIFIED FINE & COARSE SAND
- BROWN-RED BROWN FINE TO COARSE SAND & FINE TO MEDIUM GRAVEL (VERY MOIST)(DENSE)
- FINE SAND, TRACE SILT (MOIST)
- LIGHT BROWN FINE TO COARSE GRAVEL & SAND, LITTLE CLAY (SLIGHTLY MOIST)(VERY DENSE)
- GRADING NO CLAY
- GRADING DARKER BROWN COLOR
- YELLOW-BROWN FINE TO MEDIUM SAND,STRATIFIED (SLIGHTLY MOIST)(DENSE)
- GRADING WITH SOME COARSE SAND
- BOULDER
- FINE TO COARSE SAND & FINE TO MEDIUM GRAVEL, TRACE FINES (MOIST)(VERY DENSE)
- GRADING LESS GRAVEL
- (SATURATED)

1. BORING COMPLETED TO A DEPTH OF 54 FEET ON 1/15/86.
2. NO DRILLING MUD USED.
3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/15/86.

BORING 107

SURFACE ELEVATION 206.54'



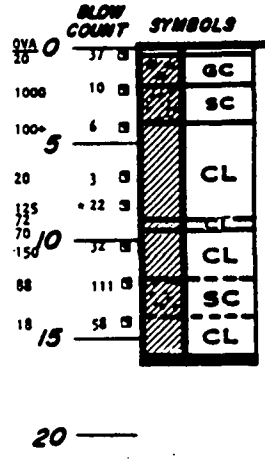
DESCRIPTIONS

- YELLOW CLAYEY SAND WITH ROOTS (VERY MOIST)
- BROWN-RED CLAYEY SAND & GRAVEL (MOIST)(DENSE
- BLACK-GRAY CLAYEY SAND & GRAVEL WITH SLAG & DEBRIS (WET)(DENSE)(FILL)
- YELLOW TO BROWN CLAY WITH SOME SAND, TRACE FINE GRAVEL (DRY)(HARD)(ORGANIC ODOR)
- STRATIFIED SANDY CLAY & MEDIUM SAND WITH LITTLE FINE GRAVEL (MOIST)(ORGANIC ODOR)
- BROWN-RED CLAY, TRACE FINE GRAVEL & SAND (MOIST)(VERY STIFF)
- GRADING WITH FINE TO MEDIUM SAND
- LIGHT BROWN SILTY SAND & FINE TO COARSE ANGULAR GRAVEL (VERY MOIST)(VERY DENSE)
- BROWN FINE TO MEDIUM CLAYEY SAND, TRACE FINE GRAVEL (VERY MOIST)(DENSE)(ORGANIC ODOR)
- BROWN FINE TO COARSE STRATIFIED SANDS WITH BLACK DISCOLORATION (MOIST)(ORGANIC ODOR)
- GRADING WITH TRACE FINE GRAVEL
- GRADING VERY DENSE
- GRADING FINE SAND
- GRADING WITH STRONG ORGANIC ODOR
- GRADING WITH COARSE STRATIFIED SANDS (MOIST)
- BROWN FINE TO COARSE CLAYEY SAND WITH LITTLE GRAVEL (VERY MOIST)(VERY DENSE)
- BROWN FINE TO COARSE SANDY GRAVEL WITH CLAY (MOIST)(VERY DENSE)
- (SATURATED)

1. BORING COMPLETED TO A DEPTH OF 50 FEET ON 1/16/86.
2. NO DRILLING MUD USED.
3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/17/86.

BORING 108

SURFACE ELEVATION 209.18'



DESCRIPTIONS

- ASPHALT
- BLACK SANDY CLAY AND ANGULAR GRAVEL (MOIST)(DENSE)(FILL)
- BLACK FINE TO COARSE CLAYEY SAND WITH SOME GRAVEL & SLAG (MOIST)(MEDIUM DENSE)(ORGANIC ODOR)(FILL)
- BLACK SANDY CLAY, LITTLE FINE GRAVEL (WET)(SOFT)(STRONG ORGANIC ODOR)
- GRADING WITH MOTTLED YELLOW-BROWN CLAY
- GRADING BLACK COLOR
- GRAY CLAY
- RED-BROWN CLAY, LITTLE GRAVEL (SLIGHTLY MOIST)(DENSE)(STRONG ORGANIC ODOR)
- GRADING WITH FINE TO MEDIUM SAND
- RED-BROWN CLAYEY SAND (SLIGHTLY MOIST)(VERY DENSE)(STRONG ORGANIC ODOR)
- RED-BROWN SANDY CLAY, TRACE FINE GRAVEL (SLIGHTLY MOIST)(DENSE)(STRONG ORGANIC ODOR)

1. BORING COMPLETED TO A DEPTH OF 16 FEET ON 1/17/86.
2. NO DRILLING MUD USED.
3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/17/86.

LOG OF BORINGS

ATTACHMENT B

Dames & Moore

APPENDIX D

MAY 19, 1986 LETTER REPORT,
"SOIL SAMPLING RESULTS AND CLEANUP PLAN RECOMMENDATIONS
CELL NOS. 2 and 3 EXCAVATIONS"

ATTACHMENT B

Dames & Moore

6 Commerce Drive
Cranford, New Jersey 07016
(201) 272-8300

May 19, 1986

Ms. Dawn Pompeo
Dept. of Environmental Protection
Bureau of Industrial Site Evaluation
Hazardous Site Mitigation
CN-028
428 East State Street
Trenton, New Jersey 08625

Re: Soil Sampling Results and Cleanup Plan Recommendation
Cell Nos. 2 and 3 Excavation
PPF/Norda Facility
East Hanover, New Jersey
For ADRON, Inc.

Dear Ms. Pompeo:

In accordance with our recent discussions, we are providing the results of chemical analysis for soil samples obtained from Cell Nos. 2 and 3 at the PPF/Norda facility. We discuss the cleanup efforts and soil sampling efforts which identified the locations of residual compounds in excavation soils. On the basis of this information we then provide our conclusions and recommendations for finalizing Cell Nos. 2 and 3 cleanup.

CLEANUP ACTIVITY – CELL NOS. 2 AND 3 EXCAVATION

Removal Operations

Drum removal activities at the site are complete at Cell Nos. 2 and 3. During removal efforts, cells 2 and 3 were found to join. The drum deposits in the north end of Cell 3 extended to meet the drum deposits in the south end of Cell 2. Therefore, a single excavation was opened to clean up both these cells. Removal was conducted using backhoes, a vacuum truck and dump trucks, as described in the Site Cleanup Plan. Approximately 1,300 drums, 30,000 gallons of perched water, and 1,500 cubic yards of backfill and contaminated soil have been removed during the excavation of those cells. Cleanup activities in the drum cells continued until all drums were excavated and natural soils encountered and all ponded water was evacuated from the excavation. The source of contamination, therefore, has been removed.

Soil Sampling and Analysis

On April 14, 1986, Dames & Moore obtained four bottom and six sidewall soil samples from the excavation. The samples were stored in ice coolers and delivered to Century Laboratories in Thorofare, New Jersey for analysis of full priority pollutants and "plus 40 library scan". The laboratory composited all bottom and all sidewall samples and ran analyses on the two composites. In addition, duplicates of each composite were also analyzed for QA/QC purposes. After the composites were analyzed, the four bottom soil samples were then analyzed separately to determine the presence of base/neutral and volatile organic priority pollutant compounds. Sampling locations are provided on Figure 1.

ATTACHMENT B

Results of Analysis

All priority pollutant organic compounds detected in the sidewall composites were below general ECRA alert levels. Low levels of volatile organic and base/neutral compounds were detected in the bottom soil composites. The volatile compounds of concern are those reported as Total Dichlorobenzenes. However, Total Dichlorobenzenes reported as volatiles represent the sum total concentrations of the individual dichlorobenzene compounds (i.e., 1,2-dichlorobenzene and 1,4-dichlorobenzene) that are expressed as volatiles. The individual dichlorobenzene compounds are also identified in the base/neutral extraction and do not represent separate compounds. Concentrations of Total Dichlorobenzenes reported as volatiles in the bottom composite and bottom QA/QC composite are 7.6 and 9 parts per million (ppm), respectively. These concentrations correspond with the total concentration of 1,2 and 1,4-dichlorobenzene reported as base/neutral compounds — 6.8 ppm and 15 ppm in the bottom composite and bottom QA/QC composite, respectively.

The base/neutral compounds detected in the bottom composite are 1,2-dichlorobenzene, 6 to 14 ppm; 1,4-dichlorobenzene, 0.8 to 1 ppm; and bis(2 ethylhexyl) phthalate, 5 to 7 ppm. Concentrations of total base/neutral compounds ranged from 13.8 to 20 parts per million in the bottom composite and QA/QC bottom duplicate. It is these compounds which are also expressed as Total Dichlorobenzenes detected in the volatile fraction. Benzene, detected at an maximum concentration of 0.7 ppm was the only other volatile detected in the bottom composites. Cadmium was also detected at concentrations slightly above ECRA alert levels.

Additional analysis for base/neutral and volatile compounds performed on the four individual bottom samples detected base/neutral compounds only in Sample B-1 from the north end of the excavation. The compounds detected were those which were detected in the composite sample analysis. Concentrations of the individual compounds ranged from 0.5 ppm to 32 ppm. The sum total of base/neutral compounds concentration in Sample B-1 is 44.5 ppm. A very low level of benzene was detected in Sample B-2 below ECRA alert levels. Toluene and fluorotrichloromethane were detected at trace levels (below method detection limits) in Samples B-3 and B-4, respectively. Total Dichlorobenzenes expressed as volatiles are reported at 36 ppm.

In summary, Sample B-1 contained low levels of base/neutral compounds and was the only sample which contained priority pollutant organic compound concentrations above ECRA alert levels. These levels are only slightly above ECRA alert levels. No other samples contained significant levels of organic compounds. Cadmium concentrations as detected in the composites were slightly above ECRA alert levels.

Tables 1 and 2 present the laboratory analytical data. In addition, copies of the laboratory reports are also enclosed.

ATTACHMENT B

Conclusions and Recommendations

The source of contamination has been removed. Low levels of residual organic compounds only slightly above ECRA alert levels were detected in only one bottom sample location. In light of this, we believe the present state of cleanup efforts for Drum Cell Nos. 2 and 3 is satisfactory and recommend that the excavation be backfilled with clean, compacted borrow material. Final landscaping efforts should include crowning the excavation with clayey topsoil extending from the fence east of the excavation to the pavement west of the excavation.

If there are any comments or questions, please contact the undersigned.

Very truly yours,

DAMES & MOORE

Anthony O. Kaufman
Project Manager

AOK:jp

ATTACHMENT B

TABLE 1

SUMMARY OF ANALYSES

DRUM CELL NOS. 2 AND 3 EXCAVATION

SIDEWALL AND BOTTOM COMPOSITES

PPF/ADRON FACILITY

EAST HANOVER, NEW JERSEY

	Bottom Composite	Bottom QA/QC Composite	Sidewall Composite	Sidewall QA/QC Composite
Priority Pollutant Volatile Organic Compounds				
Benzene	0.7	< 0.5		
Chlorobenzene			0.2	< 0.2
Total Dichlorobenzene	7.6	9		
Priority Pollutant Base/Neutral Compounds				
1,2-Dichlorobenzene	6.0	14		
1,4-Dichlorobenzene	0.8	1		< 0.4
bis(2-ethylhexyl) phthalate	7.0	5.0	8	
Metals and Physical Chemistry				
Antimony	< 1	< 1	< 1	< 1
Arsenic	16.4	16.0	15.9	17.6
Beryllium	< 2	< 2	< 2.0	< 2
Cadmium	8.6	8.4	9.5	9.4
Chromium	24	17	24	24
Copper	27	27	27	28
Lead	21	16	< 10	< 10
Mercury	0.6	0.4	< .04	.04
Nickel	34	33	33	34
Selenium	< 1	< 1	< 1	< 1
Silver	< 2	< 2	< 2	< 2
Thallium	59	58	64	72
Zinc	83	80	102	104
Phenols (total)	3.8	4.0	.42	.16
Cyanide	< .10	< .10	< 10	< .10

NOTES:

1. Concentrations are in parts per million (ppm).
2. Blank spaces indicate compound not detected in that sample.
3. Refer to Figure 1 for sampling locations.

ATTACHMENT B

TABLE 2

SUMMARY OF ANALYSIS

DRUM CELL NOS 2 AND 3 EXCAVATION

BOTTOM SOIL SAMPLES

PPF/ADRON FACILITY

EAST HANOVER, NEW JERSEY

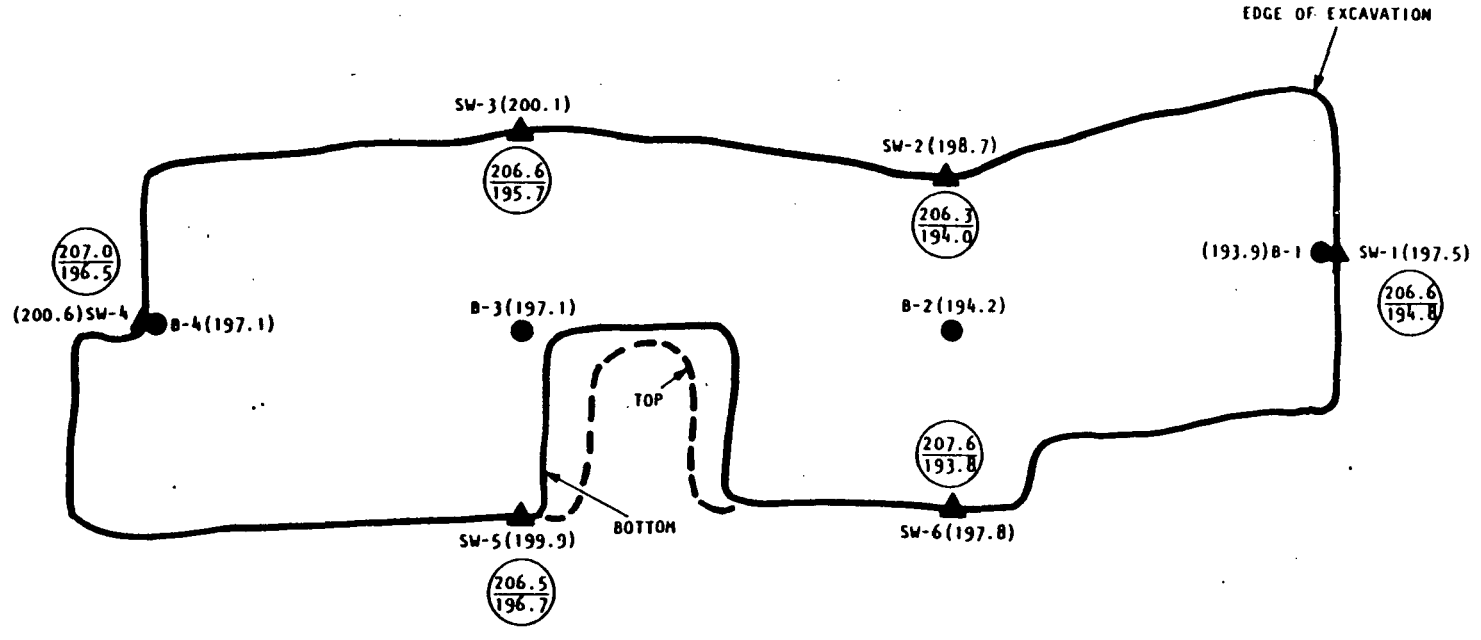
	B-1	B-2	B-3	B-4
Priority Pollutant Volatile Organic Compounds				
Benzene		0.6		
Toluene			< 0.4	
Fluorotrichloromethane				< 0.1
Total Dichlorobenzenes	36.0			
Priority Pollutant Base/Neutral Compounds				
1,2-Dichlorobenzene	32			
1,3-Dichlorobenzene	0.5			
1,4-Dichlorobenzene	5			
bis(2-ethylhexyl) phthalate	7			
Di-n-butyl phthalate		2*		

NOTES:

1. Concentrations are in parts per million (ppm).
2. Blank spaces indicate compound not detected in that sample.
3. Refer to Figure 1 for sampling locations.

* Indicates compound also detected in blank.

ATTACHMENT B



KEY:

- ▲SW-6 SIDEWALL SAMPLE POINT
- ● B-4 BOTTOM SAMPLE POINT
- (197.1) APPROXIMATE ELEVATION OF SAMPLE POINT
- 206.5 / 196.7 APPROXIMATE ELEVATION TOP OF EXCAVATION / APPROXIMATE ELEVATION BOTTOM OF EXCAVATION

SAMPLING LOCATIONS
DRUM CELLS NOS. 2 & 3 EXCAVATION
MAP VIEW

ADRON, INC.
EAST HANOVER , N.J.

0 10 20 FEET

DAMES & MOORE

ATTACHMENT B

APPENDIX D

MAY 19, 1986 LETTER REPORT,
"SOIL SAMPLING RESULTS AND CLEANUP PLAN RECOMMENDATIONS
CELL NOS. 2 and 3 EXCAVATIONS"

ATTACHMENT B

DAMES & MOORE A PROFESSIONAL LIMITED PARTNERSHIP
6 COMMERCE DRIVE, CRANFORD, NEW JERSEY 07016-1101 (201) 272-8300

June 22, 1987

Ms. Dawn Pompeo
N.J. Dept. of Environmental Protection
Bureau of Industrial Site Evaluation
401 East State Street
CN-028
Trenton, New Jersey 08625

Re: Attenuation Study and Cleanup Plan Recommendations
Drum Cell Excavation No. 4
Adron/PPF Facility
East Hanover, New Jersey
ECRA Case No. 84294

Dear Ms. Pompeo:

In accordance with our recent correspondence and NJDEP's letter of April 15, 1987, we are providing the results of soil sampling/Attenuation Study activities in Drum Cell No. 4 at the above referenced facility. In this letter, we review cleanup activities, agreements and authority under which the Attenuation Study was performed, the Attenuation Study, results of soil sample analysis, results of ground water monitoring, and provide recommendations for finalizing Cell No. 4 cleanup.

CLEANUP ACTIVITY — CELL NO. 4 EXCAVATION

REMOVAL OPERATIONS

Drum removal activities at the site are complete at Cell No. 4. Removal was conducted using backhoes, a vacuum truck, sump pumps and dump trailers as described in the Site Cleanup Plan. Approximately 1,400 drums, 43,000 gallons of perched water, and 1,000 cubic yards of backfill and contaminated soil have been removed during the excavation of Drum Cell No. 4. Cleanup activities in the drum cell continued until all drums were excavated and natural soils were encountered and all perched water was evacuated from the excavation. The excavation is currently 155 ft by approximately 22 ft. wide and up to 10 ft. deep. The source of contamination, therefore, has been removed.

After removing this material, composite samples from the excavation sidewalls and bottom were collected and analyzed. Discrete analysis was performed on the individual samples comprising the composites to identify "hot spots". Additional sampling was then performed at depth at the hot spots. The results of these earlier sampling activities were provided to NJDEP in Dames & Moore's April 7, 1986 letter sent to your attention.

Subsequent to NJDEP review of data contained in the April 7 letter, additional investigations, including soil sampling and analysis below the excavation and ground water monitoring was proposed and performed at the excavation. Analyses of the data generated in these additional activities is provided in this letter. The sampling chronology is summarized below.

ATTACHMENT C

AGREEMENTS, AUTHORITY AND SCOPE OF ACTIVITIES

NJDEP, Adron and Dames & Moore attended a meeting on July 31, 1986 in Trenton to review the results of soil sampling and address various technical issues related to this project. The outcome and decisions reached at the meeting were described in Dames & Moore's August 28, 1986 letter. The issues resolved at that meeting included acceptance of soil sample analyses which were performed in accordance with the NJDEP-accepted Sampling Plan, establishment of future QA/QC protocol, a decision to revise the Sampling Plan to eliminate compositing procedures, and establishment of additional sampling activities as the final investigative efforts prior to backfilling the excavation.

The additional investigations as agreed to consisted of:

- Obtaining one soil sample for analysis of full priority pollutants with plus 40 library search for selection of analytic target compounds;
- Extending attenuation sampling to greater depths at two locations, with analysis for selected compound groups;
- Additional soil removal at hot spots to reduce levels of residual compounds in soils immediately below the base of the excavation. NJDEP approved this approach in Mr. Joseph Fallon's letter of October 2, 1986.

The single sample obtained to refine target parameters was collected on November 18, 1986. Upon review of the results, it was decided to include additional compound groups in deeper attenuation sample analysis. This information and copies of the laboratory report were forwarded to NJDEP in Dames & Moore's letter of January 16, 1987.

Initial attempts were made on February 4, 5, 6 and 10 to obtain soil samples for the Attenuation Study using a drill rig. However, due to the extremely dense soils in the excavation bottom, split spoon samplers advanced by a 300 pound hammer met refusal and Denison core samples also could not be successfully obtained. Boring logs are presented on Figure 1. During several telephone discussions with your office and with Mr. Jilmaz Arhan (NJDEP, BEERA), it was agreed that test pits excavated by backhoe would serve as an appropriate alternative for sample collection. The sampling program was completed on April 14, 1987 and was summarized in Dames & Moore's letter of April 29, 1987. The results of analysis were not available at that time, but are included with this submittal.

ATTENUATION STUDY ACTIVITIES

Sampling activities in Drum Cell No. 4 are summarized below:

Sampling Date	Samples Obtained and Analysis Performed	Conclusions Based on Sampling Data
December 4, 1985	Excavated test pit adjacent to Drum Cell No. 4. Collected six soil samples for volatile organic compound analysis. Test pit location shown on Figure 2. Data provided to NJDEP in March 4, 1986 data submittal.	No volatile organic contaminants were detected in the samples.
February 27, 1986	Collected six sidewall samples from Cell No. 4. Bottom samples composited and sidewall samples composited for analysis of full priority pollutants with "plus 40 library search". Sample locations shown on Figure 2. Data provided to NJDEP on April 7, 1986.	Volatile organic, base/ neutral organic and phenolic compounds exist at one or more sample locations.
March 6, 1986	Each of the six sidewall and each of the six bottom samples analyzed separately for priority pollutant volatile and base/ neutral organic compounds. Bottom samples also analyzed for total phenolics. Sample locations shown on Figure 2. Data provided to NJDEP on April 7, 1986.	Two sidewall and three bottom samples contained volatile organic and base/neutral organic compounds. One bottom sample contained high concentrations of phenolics.
March 13, 1986	Collected three sidewall samples to 3½ foot depth in east sidewall of Cell No. 4. Collected six bottom samples at two locations (three samples each location) of most extensive contamination to 3½ foot depths. Samples used to establish concentration gradient in soil. Each sample analyzed for priority pollutant volatile and base/ neutral organic compounds.	Concentration gradient in soils established both vertically and horizontally for areas of most extensive contamination identified by March 6 sampling. Concentrations of organic compounds decrease significantly with depth and horizontally away from drum cell excavation bottom and walls.

ATTACHMENT C

	Sample locations shown on Figure 2. Concentration gradient shown on Figure 2. Data provided to NJDEP on April 7, 1986.	
July 31, 1986	Meeting in Trenton with NJDEP to discuss project status and Deeper Attenuation Studies.	
October 2, 1986	NJDEP approval letter for Deeper Attenuation Studies.	
November 18, 1986	Obtained additional soil sample from cell bottom soils to refine target compounds for subsequent analysis. Information provided to NJDEP on January 16, 1987.	Future sampling activities to include analysis for petroleum hydrocarbons and full priority pollutants on selected soil samples.
February 4-10, 1987	Attempted use of drill rig to obtain deeper samples for Attenuation Study were unsuccessful using Denison core samples and split spoons. Boring logs attached to this letter.	Soils in excavation bottom are extremely dense.
February 25, 1987	Install MW-6 on north side of property.	Stratigraphy and depth to ground water is similar to that observed at other areas of the site.
March 20, 1987	Sample all six monitor wells for volatile organic compounds and plus 15 library search.	Trace levels (low parts per billion range) of volatile organics detected in water samples. Compound groups detected in ground water are different than those detected in Cell 4 subsoils.
April 14, 1987	Successfully utilize backhoe to obtain samples to 10 feet below excavation bottom at hot spots.	Residual compounds in excavation subsoil are below ECRA action levels within 3 to 6 feet of excavation bottom.

ATTACHMENT C

RESULTS OF SOIL SAMPLING

Test pits were advanced at locations B-2 and in the immediate vicinity of B-4 using a Catapillar 225 backhoe. Access difficulties prevented the backhoe arm from reaching location B-4 and the test pit was offset several feet. Test pit locations are shown on Figure 2. Soil samples were extracted from each test pit at 4 to 6 foot, 6 to 8 foot and 8 to 10 foot depths. The samples were collected at increasing depths beneath the excavation to illustrate an extension of the the attenuation of residual compounds in soil as one moves deeper beneath the excavation. Attenuation across the first 3½ feet of soils beneath the excavation was previously shown through 1984 sampling efforts. Each sample was collected from the backhoe shovel using a cleaned stainless steel trowel and placed in appropriate containers provided by the laboratory. Samples were stored in ice coolers for transport to the laboratory. Care was taken to collect only that soil which had not come into direct contact with the sides of backhoe shovel. Field and trip blanks accompanied sample shipments.

Each sample was analyzed for petroleum hydrocarbons, including a sample obtained from approximately 10½ feet at test pit B-4. In addition, the 4 to 6 foot samples and 8 to 10 foot samples were analyzed for full priority pollutant compounds with plus 40 search. The 6 to 8 foot samples were analyzed for priority pollutant base/nautral and volatile organic compounds only. Analytic results are presented on Tables 1 and 2 and depicted on Figures 2, 3 and 4.

The results indicate that no priority pollutant metals were detected in any soil sample at levels above ECRA action guidelines. No pesticide, PCBs or acid extractable organic compounds were detected at depth in the excavation. (Trace levels (BMDL) were detected in the November 15, 1986 sample.) Sampling at the hot spots for organic compounds and petroleum hydrocarbons has revealed that concentration levels of priority pollutant volatile organic and base/neutral organic compounds decrease significantly immediately below the base levels of the excavation. With minor fluctuations, this attenuation continues throughout the sampling intervals for both suites of organic compounds as well as petroleum hydrocarbons.

At sampling location B-2, the sum total of volatile compounds decreases from 4.6 ppm at one-half foot to .5 ppm at 3½ feet beneath the excavation and continues to decrease to .086 ppm at 8 to 10 foot depths. The sum total base neutral compounds detected at 146 ppm at one-half foot depth decreases to .6 ppm at 1½ foot depths and remains below ECRA action levels with minor fluctuations at each progressively deeper sampling point. At these depths tested, petroleum hydrocarbon levels are reported at < 6.5 ppm, well below ECRA action levels.

At sampling location B-4, sum total concentration of volatile organics at one-half foot depth is 12.5 ppm. The concentration of volatile organics in the confirmation sample obtained in December 1986 from approximately 1½ foot depths, is reported at 19 ppm, however, this apparent increase is due to the reporting of dichlorobenzenes (extractable compounds) in the volatile scan of the December sample. Subsequent analysis of deeper samples reveal attenuation with depth. With the exception of the 3 to 6 foot sampling intervals in which 2 to 6 ppm of toluene were detected, remaining deeper samples contained only trace levels of total volatile organic compounds at concentration levels less than .027 ppm.

Similar attenuation is observed for the base/neutral organic compounds at location B-4. Sum total concentrations of base/neutrals are recorded as high as 392 ppm at 1½ foot depth. These levels decrease significantly to 20 ppm at 2½ feet, and continue to decrease to less than .36 ppm at the deepest sampling point.

The deeper soil sampling and analysis performed at the hot spots in April 1987 confirmed and extended results of the limited Attenuation Study performed in 1986. At the hot spots, concentration levels of organic compounds are within ECRA action levels within approximately three feet of the excavation bottom at location B-2 and within approximately 4 to 6 feet of the bottom at location B-4. The compounds which NJDEP has indicated are of most concern - benzene, toluene, xylene, nitrobenzene and 1,2-diphenyl hydrazine - are either not detected or are found at very low concentrations (less than 60 parts per billion) in the deeper soil samples.

GROUND WATER MONITORING

Ground water sampling has been performed in 1984 and in 1987. Ground water flow direction is to the south and the water table lies approximately 40 feet beneath the base of the excavation. Five monitoring wells were installed in 1984 and a sixth well installed in 1987 (Figure 5). NJDEP has indicated concern for ground water quality beneath the site, and to this end, the sixth monitoring well was recently installed and all wells were sampled. The results of 1984 analysis indicate that petrachlorophenol was the only acid extractable compound detected, three phthalate compounds were detected at trace (BMDL) levels and total volatile organic compounds were detected in the low ppb range. The recent (1987) ground water sampling revealed a total of nine priority pollutant volatile organic compounds. The analytic results are presented on Table 3. All but two of these compounds were detected at concentrations below 30 parts per billion. Trichloroethylene and 1,1,1-Trichloroethene were detected at higher concentrations.

The priority pollutant volatile compounds detected in both sets of ground water samples across the site were compared with compounds detected in Cell No. 4 subsoils. Only three compounds, methylene chloride and tetrachloroethane and toluene are found in ground water samples and in soils beneath the excavation. The concentration of these compounds in ground water are low - 27 ppb, 34 ppb, and BMDL for methylene chloride and tetrachloroethane and toluene, respectively. Methylene chloride is likely a laboratory induced constituent and not necessarily a ground water constituent. None of the remaining volatiles detected in the soil sampling are found in ground water. In addition, of the 10 base/neutral compounds detected in the excavation soils, only three were detected in the ground water and these were at trace (BMDL) levels.

For the 1987 ground water sampling, methylene chloride and tetrachloroethane are the only volatiles which were also detected in soils. Methylene chloride is probably a laboratory induced compound and tetrachloroethane was detected at trace levels.

Monitor well MW-2 is located immediately downgradient of Drum Cell No. 4. With the exception of methylene chloride, no priority pollutant volatile organic

compounds were detected both in this well and in excavation soils. No base/neutral compounds were detected in MW-2 in the 1984 period of ground water sampling. Since different suites of compounds are found in Cell No. 4 and ground water samples obtained both across the site and immediately downgradient of the excavation, it appears that the drum cell is not responsible for compounds detected in ground water. Table 4 presents comparison of ground water and soil sampling analytic results.

CONCLUSIONS AND ECOMMENDATIONS FOR CLOSING EXCAVATION

On the basis of data gained through soil sampling and ground water monitoring, the following conclusions have been reached:

- The source of contamination - drums, perched water and backfill - has been removed from the excavation.
- Very dense soils underlie the excavation.
- "Hot spots" were identified through initial soil sampling efforts.
- Subsequent sampling at hot spots reveals rapid attenuation of residual compounds within the first 1½ to 2 feet beneath the excavation bottom.
- Deeper sampling to extend the initial attenuation sampling verifies the attenuation of residual compounds.
- Compounds identified by NJDEP as being of most concern are not detected or are detected at extremely low levels in the deeper soil samples.
- Ground water is approximately 40 feet below the excavation bottom.
- Methylene chloride and tetrachloroethane are the only priority pollutant volatile organic compound detected during most recent sampling in both excavation soils and site ground water. Different suites of compounds are detected in Cell No. 4 subsoils and in ground water.
- Monitor well MW-2 is located hydraulically downgradient of Drum Cell No. 4. Methylene chloride is the only priority pollutant volatile organic compound detected at MW-2 and in excavation subsoils. Different suites of compounds are detected in Cell No. 4 subsoils and in ground water immediately downgradient of the cell.
- Concentrations of residual compounds detected at hot spots are below ECRA action limits within approximately three feet (location B-2) and approximately six feet (location B-4).

On the basis of these conclusions, and in accordance with understandings previously reached with NJDEP, we plan to take the following action:

although these sampling locations have been called Hot spots they have not been delineated. Post-ex sampling must be conducted

1. We shall remove additional soil at the hot spots (B-2, B-4 and B-6) to a depth of three feet. This will reduce concentration levels of residual compounds from several hundred ppm to at most, tens of ppm total organic compounds. The extent of this additional removal will extend approximately 15 feet north and south (trench length) around the hot spots and 10 feet east and west (trench width) around the hot spots. Visual observation and infield screening with an HNu PID by comparing readings obtained in the newly removed areas with background levels in the excavation will be used to assess the extent of the additional removal.

2. Following completion of this work, we shall fill the excavation with clean, compacted fill. The site shall be crowned with clayey topsoil and reseeded. Surface slopes should provide for drainage away from the excavation and onto the paved parking area.

3. The ground water monitoring program already initiated shall be maintained in the present form for the short-term. We shall be discussing this aspect of the investigation in more detail by separate letter to you.

4. After backfilling Drum Cell No. 4, we shall submit a proposal to NJDEP concerning the closing of remaining drum cell excavations and a plan to initiate further drum removal activities in Area S-5 and near the fire pond/vehicle maintenance building. The plan shall be consistent with the methodology approved and implemented for Drum Cell No. 4. Removal activities in Area S-5 and the area near the fire pond/vehicle maintenance building will be implemented after closing existing open excavations.

We plan to commence the work outlined above in early July 1987 and to continue day by day until completion. This date should allow NJDEP to schedule a representative to be on site to observe activities. We will confirm this date by telephone approximately one week prior to initiating site work.

If there are any questions, comments or objections to this undertaking, please contact the undersigned at your earliest convenience.

Very truly yours,

DAMES & MOORE

Anthony O. Kaufman

Anthony O. Kaufman
Project Manager

AOK:jp

cc: Mr. L. Amaducci, Adron
Mr. Robert Del Tufo, Hannoch Weisman

ATTACHMENT C

TABLE 2
ATTENUATION STUDY
SUMMARY OF ANALYSES
DRUM CELL EXCAVATION NO. 4
BOTTOM SAMPLING LOCATION B-4
ADRON/PPF FACILITY

Sample Designation: / Date Collected: / Depth Sampled: / Parameter	B-4 11/18/86 4"-6"	B-4-1A 2/27/86 1'6"	B-4-1 3/6/86 1'4"-1'6"	B-4-2 3/6/86 2'4"-2'6"	B-4-3 3/6/86 3'4"-3'6"	B-4-1 4/14/87 4'-6'	B-4-2 4/14/87 6'-8'	B-4-3 4/14/87 8'-10'	B-4-4 4/14/87 10'8"
Petroleum Hydrocarbons	NT	198	NT	NT	NT	49	8.5	6.5	12
Cyanide	NT	< .120	NT	NT	NT	.110	NT	< .110	NT
Phenols	NT	28	NT	NT	NT	.610	NT	.280	NT
Metals									
Antimony	NT	< 10,300	NT	NT	NT	< 13,000	NT	< 13,000	NT
Arsenic	NT	9,200	NT	NT	NT	2,000	NT	1,400	NT
Beryllium	NT	< 860	NT	NT	NT	< 1,100	NT	< 1,100	NT
Cadmium	NT	2,680	NT	NT	NT	< 1,100	NT	< 1,100	NT
Chromium	NT	13,200	NT	NT	NT	11,000	NT	10,000	NT
Copper	NT	25,800	NT	NT	NT	20,000	NT	21,000	NT
Lead	NT	10,700	NT	NT	NT	4,600	NT	2,800	NT
Mercury	NT	202	NT	NT	NT	370	NT	490	NT
Nickel	NT	25,800	NT	NT	NT	4,400	NT	< 4,100	NT
Selenium	NT	< 860	NT	NT	NT	< 440	NT	< 430	NT
Silver	NT	2,580	NT	NT	NT	< 2,200	NT	< 2,200	NT
Thallium	NT	< 2,000	NT	NT	NT	< 220	NT	< 220	NT
Zinc	NT	94,400	NT	NT	NT	22,000	NT	16,000	NT
Volatile Organics									
Benzene	.3	.150 (BMDL)	.5		.3	.4			NT
Toluene	1.6	5.50 (B)	1.4		2.6	6.6	.006 (BMDLX(B)	.005 (BMDLX(B)	NT
1,2- and 1,4-Dichlorobenzenes	NR	11.0	NR	NR	NR	1.7	.010*	.013*	NT
Ethylbenzene	2.40	2.40			.3	.24 (BMDL)			NT
Total Xylenes	8.2	NR	1.0 (BMDL)	.2	.8	NR(1.41)			NT
Methylene Chloride			.5 (BMDL)				.008		NT
Fluorotrichloromethane	3.3 (B)		13.6 (B)	1.5 (B)	7.5 (B)				NT
Sum Total of Volatiles	12.5	< 19.05	< 3.4	.2	4.0	< 8.9	< .024	< .018	NT
Base/Neutral Organics									
1,2-Dichlorobenzene	36.0	2.8							NT
1,3-Dichlorobenzene									NT
1,4-Dichlorobenzene	6.0	.250 (BMDL)							NT
1,2-Diphenylhydrazine				14	24				NT
Nitrobenzene	310	8.4	21.0	6	6	32	1.2	.060 (BMDL)	NT
Diethyl phthalate		380				2.2	3.0	.240	NT
Di-n-butyl phthalate		1.3				.85	.093	.060 (BMDL)	NT
Bis-2-ethylhexyl phthalate									NT
Butyl benzyl phthalate						.11			NT
Sum Total Base/Neutrals	352	< 392.75	21	20	30	35.16	4.293	< .360	NT
Acid Extractable Organics									
None Detected									
Pesticides/PCB									
Aldrin	.135 (BMDL)								
d-BHC	.126 (BMDL)								
g-BHC	.020 (BMDL)								
Heptachlor	.075 (BMDL)								
Heptachlor Epoxide	.075 (BMDL)								

1.0 ppm must excavate to 6' and collect a targeted post-ex sample

NOTES:

Results are in parts per million (ppm). Metals are reported in parts per billion (ppb).

NT = Not Tested
NR = Not Reported
NR (1.41) = Not reported but identified in library search at estimated concentration shown in parenthesis.
* = Sum of these compounds when reported separately.
B = Compound detected in blank.
BMDL = Compound detected below method detection limit. Value reported is either estimated or is detection level.

Blank space indicates compound not detected in that sample.

Sum totals do not include compounds identified in the blanks.

Fluorotrichloromethane not included in sum totals.

ATTACHMENT C

TABLE 1
ATTENUATION STUDY
SUMMARY OF ANALYSES
DRUM CELL EXCAVATION NO. 4
BOTTOM SAMPLING LOCATION B-2
ADRON/PPF FACILITY

Sample Designation:	B-2	B-2-1	B-2-2	B-2-3	B-2-1	B-2-2A	B-2-2B	B-2-3
Sampling Date:	2/27/86	3/6/86	3/6/86	3/6/86	4/14/87	4/14/87	4/14/87	4/14/87
Depth Sampled:	4"-6"	1'4"-1'6"	2'4"-2'6"	3'4"-3'6"	4'-6'	6'-8'	6'-8'	8'-10'
Parameter								
Petroleum Hydrocarbons	NT	NT	NT	NT	6.5	6.5	6.5	6.5
Cyanide	NT	NT	NT	NT	< .110	NT	NT	< .110
Phenols	NT	NT	NT	NT	< .110	NT	NT	< .110
Metals								
Antimony	NT	NT	NT	NT	13,000	NT	NT	< 13,000
Arsenic	NT	NT	NT	NT	1,500	NT	NT	1,000
Beryllium	NT	NT	NT	NT	< 1,100	NT	NT	< 1,100
Cadmium	NT	NT	NT	NT	< 1,100	NT	NT	< 1,100
Chromium	NT	NT	NT	NT	10,800	NT	NT	6,400
Copper	NT	NT	NT	NT	22,000	NT	NT	17,100
Lead	NT	NT	NT	NT	4,300	NT	NT	2,400
Mercury	NT	NT	NT	NT	97	NT	NT	140
Nickel	NT	NT	NT	NT	6,500	NT	NT	< 4,400
Selenium	NT	NT	NT	NT	< 430	NT	NT	430
Silver	NT	NT	NT	NT	< 2,160	NT	NT	< 2,260
Thallium	NT	NT	NT	NT	< 220	NT	NT	< 220
Zinc	NT	NT	NT	NT	24,000	NT	NT	17,000
Volatile Organic Compounds								
Benzene	2.0		1.0 (BMDL)					
Toluene	2.1	1.2	1.0 (BMDL)		.002 (BMDLXB)	.002 (BMDLXB)	.003 (BMDLXB)	.002 (BMDLXB)
1,2 & 1,4-Dichlorobenzenes					.160*	.014*	.170*	.073*
Ethylbenzene								
Methylene Chloride			1.0 (BMDL)	.5 (BMDL)				
Fluorotrichloromethane		22.9 (B)	39.1 (B)	23.9 (B)				
Total Xylenes	.5	1.0						
Chlorobenzene								.011
Sum Total Volatiles	4.6	2.2	< 3.0	< .5	< .162	< .016	< .173	< .086
Base/Neutral Organics								
1,2-Dichlorobenzene	84.0		.3	.2	2.2	.300	.220	.075
1,3-Dichlorobenzene		.2			.029 (BMDL)			
1,4-Dichlorobenzene	21.0				.240	.038 (BMDL)		
1,2-Diphenylhydrazine	7.0							
Nitrobenzene	32.0							
1,2,3-Trichlorobenzene	2.0							
Diethyl phthalate		.2 (BMDL)				.054 (BMDL)		
Di-n-butyl phthalate	3.0 (B)				.110	1.1	.066 (BMDL)	.600
Bi-2-ethylhexyl phthalate		.2 (BMDL)				.047 (BMDL)	.060 (BMDL)	
Sum Total Base/Neutrals	146	< .6	.3	.2	< 2.579	< 1.539	< .346	.675
Acid Extractable Organics								
None Detected								
Pesticide/PCB								
None Detected								

NOTES:

Results are in parts per million (ppm). Metals are reported in parts per billion (ppb).

NT = Not Tested

NR = Not Reported

NR (1.41) = Not reported but identified in library search at estimated concentration shown in parenthesis.

* = Sum of these compounds when reported separately.

B = Compound detected in blank.

BMDL = Compound detected below method detection limit. Value reported is either estimated or is detection level.

Blank space indicates compound not detected in that sample.

Sum totals do not include compounds identified in the blanks.

Fluorotrichloromethane and Di-n-butyl phthalate not included in sum totals since these were detected in blank.

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TABLE 3
SUMMARY OF ANALYSIS
GROUND WATER SAMPLING RESULTS
MARCH 20, 1987
ADRON/PPF FACILITY
EAST HANOVER, NEW JERSEY

	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	Field Blank
Volatile Organic Compounds							
Carbon Tetrachloride	11.7	1.65 (BMDL)					
Chloroform	6.40						
1,2-Dichloroethane	17.7	2.83	1.77 (BMDL)	13.0			
Methylene Chloride	27.9	27.8	27.7	24.9	24.6	27.4	22.3
1,2-Trans-Dichloroethylene		22.9			4.60		
Trichloroethylene		247		3.89	33.4		
1,1-Dichloroethane					2.91	5.96	
1,1-Dichloroethylene					12.6		
1,1,1-Trichloroethane					218	6.62	
Estimated Concentrations Tentatively Identified Organic Compounds							
1,2-Propanone	35						
Ethane, 1,1-Oxybis			118	79			
Propane, 3,2-Oxybis			74				

NOTES:

Samples collected March 20, 1987 and analyzed by Environmental Testing & Certification of Edison, New Jersey for priority pollutant volatiles with library search.

Results are in ug/l (parts per billion).

Blank space indicates compound not detected for that sample.

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TABLE 4

COMPARISON OF PRIORITY POLLUTANT ORGANIC COMPOUNDS DETECTED IN GROUND WATER AND CELL NO. 4 SOILS

	Site-Wide Ground Water Samples 1984	Site-Wide Ground Water Samples 1987	Cell No. 4 Soils	Ground Water Sample MW-2 1984	Ground Water Sample MW-2 1987
Volatiles					
Carbon Tetrachloride	x	x		x	x
Chloroform	x	x		x	
1,2-Dichloroethane	x	x		x	x
Methylene Chloride	x	x	x	x	x
1,2-Trans-Dichloroethylene	x	x		x	x
Trichloroethylene	x	x			x
1,1-Dichloroethane		x			
1,1-Dichloroethylene		x			
1,1,1-Trichloroethane		x			
Toluene	x		x	x	
Tetrachloroethane	x			x	
Chlorobenzene	x			x	
Benzene			x		
1,2 and 1,4-Dichlorobenzenes			x		
Ethylbenzene			x		
Xylenes	tentatively identified		x		
Acid Extractables					
Pentachlorophenol	x				
Base/Neutral Extractables					
Di-n-octyl phthalate	x		x		
Diethyl phthalate	x		x		
Bis(2-ethylhexyl)phthalate	x		x		
1,2-Dichlorobenzene			x		
1,3-Dichlorobenzene			x		
1,4-Dichlorobenzene			x		
1,2-Diphenylhydrazine			x		
Nitrobenzene			x		
1,2,3-Trichlorobenzene			x		
Dimethyl phthalate			x		

NOTES:

Compounds detected in ground water are in low part per billion range.

MW-2 located downgradient of cell No. 4

x - Indicates compound identified in one or more wells on site.

1987 samples analyzed for volatiles and library search.

1984 samples analyzed for full priority pollutants and library search.

ATTACHMENT C

Dames & Moore

6 Commerce Drive
Cranford, New Jersey 07016
(201) 272-8300

May 5, 1986

Ms. Dawn Pompeo
Dept. of Environmental Protection
Bureau of Industrial Site Evaluation
Hazardous Site Mitigation
CN-028
428 East State Street
Trenton, New Jersey 08625

Re: ECRA Sampling Plan Results
PPF/Norda Facility
East Hanover, New Jersey
ECRA Case No. 84294
For ADRON, Inc.

Dear Ms. Pompeo:

With this letter we are transmitting three copies of our report outlining the results from implementation of the ECRA Sampling Plan for the PPF/Norda facility. The investigation was performed in accordance with the August 14, 1985 Sampling Plan as approved by NJDEP on December 5, 1985.

We have enclosed copies of air photographs obtained during the investigation and also enclosed copies of laboratory analytical reports which were unavailable for our initial data submittal to NJDEP on March 4, 1986.

If you have any questions or comments concerning this report, please contact the undersigned.

Very truly yours,

DAMES & MOORE

Anthony O. Kaufman
Project Manager

AOK:jp

Enclosures

ATTACHMENT D

ECRA SAMPLING PLAN RESULTS
PPF/NORDA FACILITY
EAST HANOVER, NEW JERSEY
ECRA CASE NO. 84294
FOR ADRON, INC.

MAY 5, 1986
JOB NO. 12295-005-10

Dames & Moore

CRANFORD, NEW JERSEY

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1.0 INTRODUCTION

In accordance with Dames & Moore's ECRA Sampling Plan dated August 14, 1985, New Jersey Department of Environmental Protection (NJDEP) letter approval of the Sampling Plan dated December 5, 1985, and the Administrative Consent Order (ACO) between Adron and NJDEP as amended by NJDEP's letter of March 6, 1986, Dames & Moore is pleased to present the results of our ECRA investigation of the PPF/Norda, East Hanover, New Jersey site. The investigation was performed in accordance with the guidelines presented in NJSA 13:1K-6 et. seq., Environmental Cleanup Responsibility Act (ECRA), and NJAC 7:1-3, Interim ECRA Regulations.

In this report, we provide a discussion of the site background, including both site geohydrology and plant history, identify the areas of investigation as performed through the past and the current investigation, present the results of chemical analysis of samples obtained on-site, and provide recommendations for additional investigation and cleanup plans as required under ECRA.

2.0 SITE BACKGROUND

2.1 PLANT HISTORY

The plant site, located at 140 N.J. Route 10, occupies approximately 17 acres in East Hanover, Morris County, New Jersey (Figure 1). The property boundaries roughly define a rectangle whose long axis runs approximately North-South. The site is situated between Route 10 and Murray Road in a commercial section of East Hanover. The site is bounded on the east by a drum recycling company, on the west by the Ramada Inn Motel and a golf driving range, on the north by Murray Road and a warehouse complex, and on the south by Route 10.

The East Hanover facility is an active flavors and fragrances manufacturing plant that supplies raw materials and other ingredients to its customers in this industry. Existing structures on-site include several buildings which consist of storage,

maintenance, administrative, laboratory and processing facilities. Processes involved as part of the manufacturing include resale and repackaging of consumer goods, compounding and blending of perfume and flavor materials, extraction of fruits and vegetables, distribution of flavor oils, and research and development. Washwater from equipment cleaning is collected in sumps adjacent to the process buildings.

Two historical fires damaged buildings at the site. In 1947, a fire destroyed a building which held cosmetics, spices and essential oils. This building was situated east of existing building No. 3 and the concrete pad on which it was built, Platform 7, still remains. In 1960, a fire damaged the second floor laboratory of existing building No. 1. Essential oils, starting materials and finished fragrance compounds were stored in the building. Water used to fight the fire was collected in a "fire pond" located at the southwest corner of the administration building. Subsequently, this area was backfilled and paved over.

In the early 1960's, construction rubble and scattered drums reported to contain hard residues and still bottoms from process activities were backfilled in the area lying between Murray Road and the northern fence boundary. Additional backfilling of this area utilized natural, surficial soils removed during construction on adjacent properties.

At about the same time, drums, reported to contain process waste and aromatic still bottoms were buried in the area between the eastern parking lot and eastern fence boundary. Additional drums were buried in an area east of this fence line. The drums were deposited in the clay layer which constitutes the surficial soils found at the site. On-site clayey soils were used as backfill during drum burial.

The current operator of the facility is PPF International. PPF obtained the property pursuant to a sale agreement made between Norda and PPF in 1984. Prior to the sale, the same manufacturing operations as described above were conducted. The transfer of plant ownership in 1984 provided the impetus for the current ECRA investigations.

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The primary areas subject to the ECRA investigations are those associated with the disposal areas, historical fires, wastewater sumps, septics, drum cleaning area, catch basins and dumpster.

2.2 SITE GEOHYDROLOGY

Stratigraphy encountered at the site consists of approximately 14 to 20 feet of relatively impermeable clayey soils overlying glacial sands and gravels. The sands and gravels contain varying amounts of fines in pore spaces and these deposits tend to grade coarser with depth. Portions of the surface cover include fill deposits containing construction debris and other refuse. Bedrock was not encountered during any of our investigations but is believed to be at depths on the order of 120 to 140 feet below ground surface.

Ground-water measurements recorded periodically in five on-site monitoring wells show that the ground-water surface lies at an elevation of ±160 feet above mean sea level. The ground-water surface lies between approximately 40 and 60 feet below existing ground surface within the sands and gravel deposits. Ground water-elevations are shown below.

Monitor Well No.	Depth to Ground Water (feet below grade)		Elevation of Ground-Water Surface (ft. above MSL)	
	11/16/84	1/7/86	11/16/84	1/7/86
1	48.25	49.82	160.51	159.00
2	55.37	56.98	161.00	159.39
3	39.16	40.68	161.45	159.93
4	42.47	44.00	161.42	159.89
5	38.17	39.65	161.67	160.19

Total difference in ground water elevation across the site is less than two feet. A ground water elevation contour map is presented in Figure 6.

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To evaluate the effect that withdrawal from production wells in the vicinity of the site may have on ground-water flow beneath the site, Stevens Type F Continuous Water Level Recorders were installed in monitoring wells Nos. 1 and 4. These instruments provide a continuous record of water level fluctuations in the wells. Records were made simultaneously for each of these wells during a one-week period in January 1986. Hydrographs for monitoring wells Nos. 1 and 4 for this period are presented on Figures 4 and 5. No significant water level changes were noted. Therefore, it appears that the observed flow direction is either naturally to the southwest or is induced by constant pumping of production wells located southwest of the site. Ground water flow direction, as determined by measurements obtained in 1984 and confirmed in 1986 is to the southwest.

3.0 AREAS OF INVESTIGATION AND SAMPLING EFFORTS

3.1 PREVIOUS WORK

Dames & Moore has previously performed several investigations of the facility as part of the ECRA activities. The results of our previous work have been presented in our reports "Geohydrologic Investigation and Consultation, Norda, Inc., Manufacturing Facility, East Hanover, New Jersey", December 1984 and "Drum Area Geotechnical Investigation, Flavors & Fragrance Manufacturing Facility, East Hanover, New Jersey", December 1985.

The 1984 report includes the results of a magnetometer survey, drilling and installation of five monitoring wells, excavation of 26 exploratory test pits, and chemical analysis of five ground water samples, one perched water sample, one sludge sample, one soil/leachate sample, and two composite soil samples. In addition, the report includes a discussion on regional and site geohydrology and ground-water quality. Preliminary cleanup plans for removal of buried drums were also provided.

The 1985 report includes the results of four soil borings and permeability tests performed on soil samples obtained from the borings.

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3.2 CURRENT INVESTIGATION

On the basis of the previous investigations, discussions with Norda and NJDEP personnel and comments from then ECRA Case Manager, Mr. Yilmaz Arhan's site inspection, the following areas of investigation were identified:

Area Designation	Description
S-1	Three sumps used to collect and contain process wash water
S-2	Septic systems
S-3	Fire pond area south of Buildings D and B-1
S-4	Drum cleaning area located northeast of Building No. 22
S-5	Fill area between Murray Road and the plant's northern fence line
S-6	Disposal area along eastern fence line in which drums containing process materials were buried
S-7	Building No. 1 and Platform No. 7 which were damaged by historical fires
S-8	Catch basins
S-9	Dumpster
S-10	Catch basin at Vehicle Maintenance Building
S-11	Fuel oil tanks
A	Background soil quality area located near plant entrance from Route 10
B	Ground water quality on-site

Sampling locations are presented on Figure 2 and Area Designations are presented in Figure 3. A description of the field investigation is presented in Appendix A.

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The results of sample analysis from Area S-7, Area A, and Area B were presented to NJDEP in our 1984 report (Appendix B). The remaining areas were investigated as part of this study. Areas S-1, S-2 and S-3 were investigated by drilling eight borings and selecting samples from each boring for analysis. Logs of the borings showing the soils encountered, results of sample screening with a Foxboro Organic Vapor Analyzer Model 128 and the samples selected for analysis are presented on Figures 8, 9 and 10. Sediment and soil samples were collected from Areas S-4, S-8, S-9, S-10 and Area A, using disposable trowels or hand auger. A water sample from a stream/seep in Area S-5 has been collected and 20 test pits excavated from which an additional soil sample was collected. Logs of these test pits are presented in Appendix C.

Drum removal efforts are ongoing in Area S-6 and soil samples have been collected from drum cell excavations as required by the Sampling Plan. Prior to implementing drum removal efforts, two test pits were excavated in the drum disposal area and 12 soil samples were collected. These are in addition to the 26 test pits excavated as part of the 1984 investigation. Samples from the test pits were collected at various depths and varying distances from the edge of drum cells and analyzed for priority pollutant volatile organic compounds. The locations of these samples and results of analyses were presented earlier to NJDEP. As additional soil sampling is performed in excavated drum cells, these data will be submitted under separate cover.

Oil stained soils in the vicinity of the oil storage tanks, Area S-11, will be removed prior to completion of the drum removal efforts. Upon completion of drum removal in Area S-6, removal plans will be implemented in Area S-5.

The following analyses were performed as part of the investigation:

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Area Designation	Number of Samples and Sample Media	Analysis
S-1	3 Soil	Volatile Organics with Plus 15 scan
S-2	6 Soil	Volatile Organics with Plus 15 scan
S-3	1 Soil	Volatile Organics with Plus 15 scan
S-4	1 Soil	Volatile Organics with Plus 15 scan
S-5	1 Soil; 1 Water	Full Priority Pollutants with Plus 40 scan
S-6	Soil as required in cleanup plan	Full Priority Pollutants with Plus 40 scan
S-7	2 Soil Components	Full Priority Pollutants plus 40
S-8	1 Soil/Sediment	VOA plus 15 and Petroleum Hydrocarbons
S-9	2 Soil	VOA plus 15
S-10	1 Soil/Sediment	VOA plus 15
S-11	Soil as required after cleanup	Petroleum Hydrocarbons
A	1 Soil	Full Priority Pollutants plus 40
B	5 Ground Water	Full Priority Pollutants plus 40

4.0 RESULTS OF LABORATORY ANALYSIS

The results of sample analysis for areas S-7, Area A and Area B were presented in our 1984 report. The results of ground water analysis (Area B) and analysis from Platform 7 (Area 7) are presented in Appendix B. Sample descriptions and the results of sample analyses for the other areas and additional analyses in

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Area A are presented in Tables 1 through 4. Table 1 presents the sample designation, sample description and sample location. Tables 2, 3 and 4 present the results of the analyses. Hard copy of laboratory reports which contain QA/QC data that cannot be presented on the tables has been presented previously to NJDEP. Laboratory reports for two samples which were unavailable earlier are enclosed with this report. Review of the laboratory's QA/QC results indicate the laboratory work is satisfactory.

The data indicate that only three soil samples showed concentration levels of priority pollutant compounds in excess of ECRA alert levels: 1) one composite surface soil sample obtained in 1984 from Platform 7 in area designation S-7 contained concentrations of total volatile organic compounds of 5.8 parts per million; 2) one soil/sediment sample from the northern catch basin in area designation S-8, contained total petroleum hydrocarbon levels of 370 ppm; and 3) one soil sample, from the fire pond in area designation S-3, contained total volatile organic compounds at a concentration of 3.6 ppm. All other soil samples were below ECRA alert levels.

During test pit exploration of Area S-5, drums were removed from several test pits. After removal of drums in Test Pit 102, a soil sample was collected from approximately eight feet below grade in natural clayey soils, approximately four feet below the drums and fill. The analysis detected methylene chloride at 16 parts per billion and toluene below method detection levels (10 ppb). The methylene chloride is likely to have been introduced at the laboratory. No other priority pollutant organic compounds were detected. This suggests that compounds which may have leaked from the drums, if any are contained in the fill.

Low levels of methylene chloride were detected in several samples. Tetrachloroethene was also detected in the plus 40 scan for several samples. We discussed this with the laboratory and were informed that methylene chloride at the levels which were detected in the samples, may be attributable to concentrations of this solvent in the ambient air at the laboratory. The tetrachloroethene is attributable as a compound also introduced at the laboratory as part of the extraction process. We have attached to this report (Appendix D), a letter from ETC which states this information.

Results of ground water sample analysis in 1984 (refer to Appendix B) show that total priority pollutant volatile organic concentration levels in the five on-site monitor wells ranged from 11 to 170 parts per billion. Furthermore, pentachlorophenol was detected in monitoring well No. 3 at 30 parts per billion and three phthalate compounds were detected at concentrations below method detection levels.

It was planned to analyze the sediment sample from the vehicle maintenance building's catch basin for volatile organic compounds with plus 15 search and total petroleum hydrocarbons. However, the catch basin barely contained enough sediment to allow for volatile compound analysis and, therefore, the petroleum hydrocarbon testing could not be performed. It was also planned to drill a separate boring to investigate the septic system at Building No. 23. However, after discussions with Mr. Yilmaz Arhan of NJDEP, that due to the relative location of this building's septic system and the system which services Building No. 27, a single boring (B-104) was suitable for investigating both areas.

5.0 DRUM AND SOIL REMOVAL ACTIVITIES

5.1 AREA S-5 — FILL AREA

On the basis of our analysis, the locations of buried drum deposits in Area S-5 have been estimated. The locations are presented on Figure 11. An estimated 500 drums are buried in the near surface fill cover. Because the drums are more randomly placed than in other areas, a more accurate estimate of number of drums cannot be made. Upon completion of removal activity in Area S-6, cleanup efforts will be implemented to remove contaminated fill and drum deposits from Area S-5.

5.2 AREA S-6 — DISPOSAL AREA

Drum removal operations in Area S-6 are currently ongoing. Removal operations are being peformed using backhoes, vacuum trucks and drum slings as described in the Cleanup Plan. As of May 1, removal efforts have included Cell Nos. 2, 3, 4 and 5 and a total of approximately 3,500 drums, 3,000 yards of

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contaminated soil and backfill, and 160,000 gallons of perched water have been removed from the site and disposed of. The results of post excavation soil sampling to date and recommendations for finalizing the cleanup have been presented previously to NJDEP . A summary report outlining removal efforts for the entire project will be issued subsequently.

5.3 AREA S-11 — FUEL OIL TANKS

Prior to demobilization of Waste Conversion, Inc., the cleanup contractors performing the drum removal, oil stained soil surrounding the fuel oil tanks at the southwest end of Building No. 3 will be excavated and the soil will be disposed of in a secure landfill. In accordance with NJDEP's approval letter of the Sampling Plan, if stains extend to a depth greater than one inch into subsoils, post excavation sampling will be implemented.

6.0 RECOMMENDATIONS FOR ADDITIONAL CLEANUP AND INVESTIGATION

The laboratory data indicate that four areas of investigation contain priority pollutant compounds above ECRA action levels. Our recommendations for additional investigations required at each location and cleanup plans for drum removal in Area S-5 are presented in the following sections. Additional investigation will be performed using the methods approved in the Sampling Plan.

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Area Designation	Results of Investigation	Recommended Activities
S-1, Sumps	No Priority Pollutant Volatiles detected above ECRA alert levels	No additional investigation or remedial action
S-2, Septics	No Priority Pollutant Volatiles detected above ECRA alert levels	No additional investigation or remedial action
S-3, Fire Pond	Priority Pollutant Volatiles detected above ECRA alert levels	Additional investigation as described in Section 6.1
S-4, Drum Cleaning	No Priority Pollutant Volatiles detected above ECRA alert levels	No additional investigation or remedial action
S-5, Fill Area	Drums buried in shallow fill cover	Removal operations as described in Section 6.2
S-6, Disposal Area	Drums buried in surficial clayey soils	Removal operations are currently being performed
S-7, Historical Fires	Priority Pollutant Volatiles detected above ECRA alert levels east of Platform 7	Additional investigation as described in Section 6.1
S-8, Catch Basins	Petroleum hydrocarbons detected above ECRA alert levels in northern catch basin	Remedial efforts as described in Section 6.3
S-9, Dumpster	No Priority Pollutant Volatiles detected above ECRA alert levels	No additional investigation or remedial action
S-10, Vehicle Maintenance Catch Basin	No Priority Pollutant Volatiles detected above ECRA alert levels	No additional investigation or remedial action
S-11, Fuel Oil Tanks	Oil stained soil will be removed subsequently	Soil sampling as described in Sampling Plan if warranted after removal
Area A	No Priority Pollutants above ECRA alert levels detected	No additional investigation or remedial action
Area B	Low levels of organic compounds detected	Additional investigation as described in Section 6.4

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Because of the areal extent of these excavations, it is recommended that removal activities start at the northern edge of the work Zone A and gradually progress to the south. Work can start on the northeast edge of Zone B and progress to the southwest (Figure 11). Temporary staging areas for drums and soil should always be kept to the south of active areas. In this manner, as the cleanup activities proceed, the temporary staging areas will be subject to subsequent cleanup and removal of any spilled substance. Furthermore, this will eliminate the need to mobilize larger construction equipment to the site. A Bobcat loader lowered into the relatively shallow excavation can be used for final excavation cleanup, if required. The excavation should be barricaded with temporary fencing and warning flagging at night or when unattended.

If the areal extent of the excavation is found to cause logistic problems for removal efforts, then excavation of the larger work zones can be performed in phases. Work Zone A can be divided into four smaller sections separated by berms constructed of natural soils inside the excavations. After removal of drums and contaminated fill, each section can be backfilled prior to initiating removal efforts in the next section. This could allow for easier access and smaller active excavations during removal operations.

6.3 AREA S-8 — NORTHERN CATCH BASIN

Petroleum hydrocarbon level of 370 parts per million was detected in the sediment sample obtained from the northern catch basin. This sediment can be removed from the catch basin using a small vacuum truck. No oily discharge has been noted in water passing from this catch basin. However, as a precautionary measure, an oil boom can be placed at the point of discharge of the storm drain in order to collect any oil which may be floating on the discharged water.

6.4 GROUND WATER

Ground-water samples were obtained from the five on-site monitoring wells during the 1984 investigation. Additional observation and recording of ground

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water levels has been maintained since then, however, no additional water quality data has been obtained. We, therefore, recommend that another round of ground-water samples be obtained in order to supplement the on-site monitoring efforts. Samples should be analyzed for priority pollutant volatile organic compounds since these compounds were the only priority pollutant organic compounds detected above method detection levels in all wells.

7.0 CONCLUSIONS

Areas of environmental investigation were delineated on the basis of previous investigations, discussion with plant personnel and NJDEP representatives and the site inspections performed by the NJDEP. These areas were investigated in accordance with the NJDEP approved sampling plan of August 14, 1985. Site remediation has been implemented at drum disposal areas along the northeastern parking lot and will be implemented in the fill area between the plant's northern fence line and Murray Road. Removal efforts are planned to be completed in the summer of 1986 and a brief report outlining that effort will be presented to the NJDEP after completion. Localized areas containing priority pollutant compounds in soil in excess of ECRA alert levels which remain at three locations (fire pond, fire platform and catch basin) will be further evaluated as described above. Additional characterization of ground water quality at the site will be evaluated as described above in order to finalize remedial action plans at the site.

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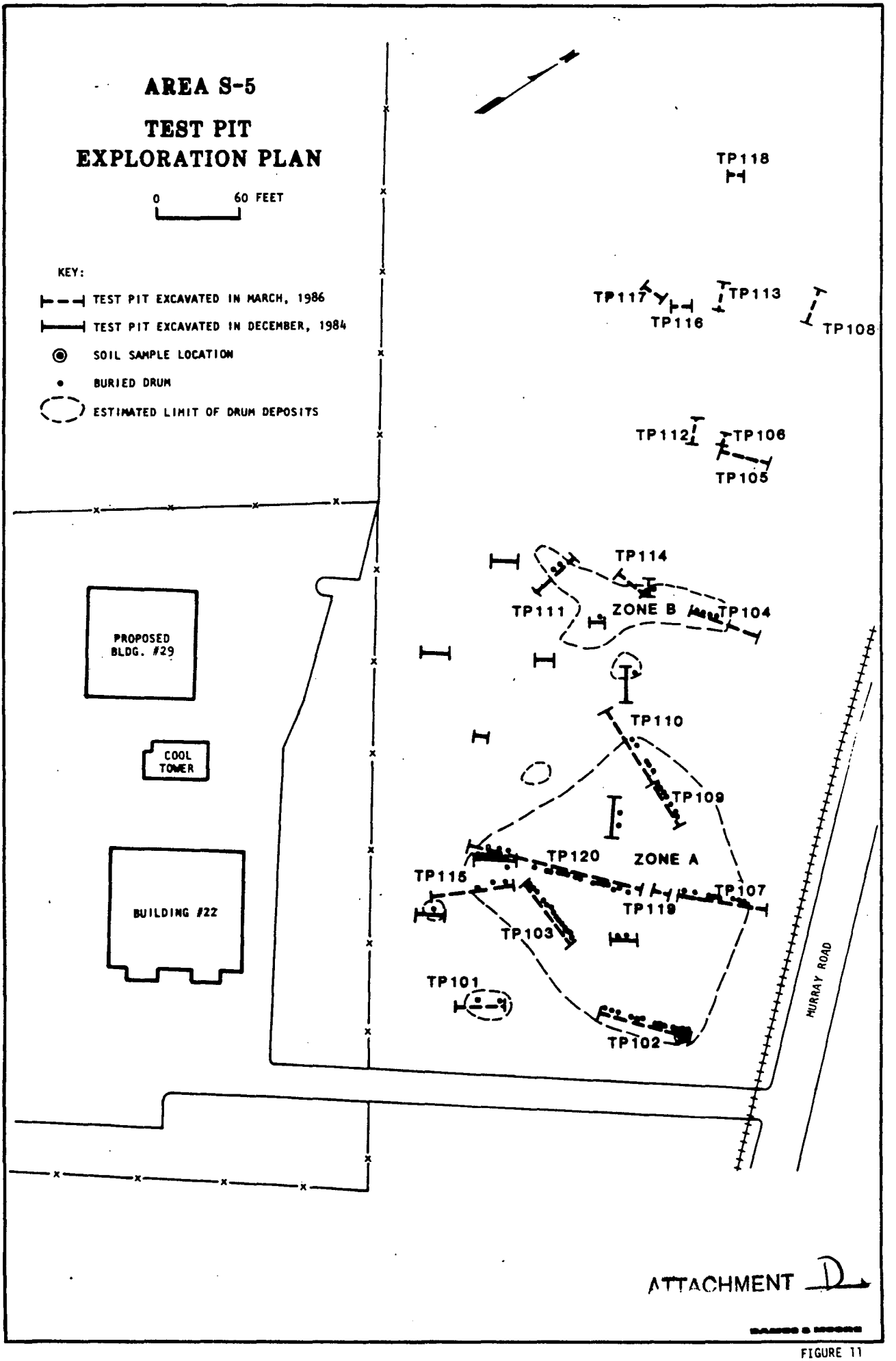

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FIGURE 11

BORING 106

SURFACE ELEVATION 210.95'

DEPTH IN FEET	OVA	BLOW COUNT / SAMPLES	SYMBOLS	DESCRIPTIONS
0			SP	ASPHALT
	88	16		YELLOW-BROWN MEDIUM SAND (FILL)
	30	15		YELLOW-BROWN SANDY CLAY (MOIST)
				GRADING BROWN-RED BROWN CLAY, TRACE FINE SAND, TRACE FINE GRAVEL (SLIGHTLY MOIST)
	52	42		GRADING STIFF
5			CL	
	78	39		
	55	64		GRADING MORE SAND & GRAVEL (HARD)
10				
	62	95		BROWN-RED BROWN CLAYEY FINE TO MEDIUM SAND & GRAVEL (MOIST) (VERY DENSE)
	42	100	SC GC	
	64	60		
15			GP	COARSE GRAVEL
	90	* 93	SC	RED-BROWN CLAYEY FINE TO COARSE SAND, SOME FINE ANGULAR GRAVEL (MOIST) (DENSE)
	60	36		BROWN-RED BROWN FINE TO MEDIUM SAND, TRACE TO LITTLE COARSE SAND & CLAY (MOIST) (DENSE)
20	88	37		
	20	33	SP	GRADING WITH TRACE GRAVEL & STRATIFIED FINE & COARSE SAND
	70	30		
25				
	18	54		BROWN-RED BROWN FINE TO COARSE SAND & FINE TO MEDIUM GRAVEL (VERY MOIST) (DENSE)
	58	55		
30	58	55	SW	
	31	50		
	14	31		FINE SAND, TRACE SILT (MOIST)
35			SP	
	14	120		LIGHT BROWN FINE TO COARSE GRAVEL & SAND, LITTLE CLAY (SLIGHTLY MOIST) (VERY DENSE)
	25	168		GRADING NO CLAY
40	4	56	GW	GRADING DARKER BROWN COLOR
	1	55		YELLOW-BROWN FINE TO MEDIUM SAND, STRATIFIED (SLIGHTLY MOIST) (DENSE)
	1	56		
45			SP	
	40	77		GRADING WITH SOME COARSE SAND
				BOULDER
	3	110		FINE TO COARSE SAND & FINE TO MEDIUM GRAVEL, TRACE FINES (MOIST) (VERY DENSE)
50	4	84	GW SW	GRADING LESS GRAVEL
	6	46		(SATURATED)
55				

1. BORING COMPLETED TO A DEPTH OF 54 FEET ON 1/15/86.
2. NO DRILLING MUD USED.
3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/15/86.

BORING 107

SURFACE ELEVATION 206.54'

DEPTH IN FEET	OVA	BLOW COUNT / SAMPLES	SYMBOLS	DESCRIPTIONS
0	0	18	CL GC SC	YELLOW CLAYEY SAND WITH ROOTS (VERY MOIST)
	4	48		BROWN-RED CLAYEY SAND & GRAVEL (MOIST) (DENSE)
		100/5"	GC	BLACK-GRAY CLAYEY SAND & GRAVEL WITH SLAG & DEBRIS (WET) (DENSE) (FILL)
5				
	3	34	CL	YELLOW TO BROWN CLAY WITH SOME SAND, TRACE FINE GRAVEL (DRY) (HARD) (ORGANIC ODOR)
	1	30	CL SC	STRATIFIED SANDY CLAY & MEDIUM SAND WITH LITTLE FINE GRAVEL (MOIST) (ORGANIC ODOR)
10	2	46		BROWN-RED CLAY, TRACE FINE GRAVEL & SAND (MOIST) (VERY STIFF)
	2	117/9"		
	4	37	CL	
15				
	2	77		GRADING WITH FINE TO MEDIUM SAND
	3	100/3"	GW	LIGHT BROWN SILTY SAND & FINE TO COARSE ANGULAR GRAVEL (VERY MOIST) (VERY DENSE)
20	3	77	SM	BROWN FINE TO MEDIUM CLAYEY SAND, TRACE FINE GRAVEL (VERY MOIST) (DENSE) (ORGANIC ODOR)
	2	70		BROWN FINE TO COARSE STRATIFIED SANDS WITH BLACK DISCOLORATION (MOIST) (ORGANIC ODOR)
	5	55		
25				
	3	37		
	2	50		GRADING WITH TRACE FINE GRAVEL
30	3	71	SP	
	3	93		GRADING VERY DENSE
	25	83		GRADING FINE SAND
35				
	80	* 77		GRADING WITH STRONG ORGANIC ODOR
	2	59		GRADING WITH COARSE STRATIFIED SANDS (MOIST)
40	4	170	SM	BROWN FINE TO COARSE CLAYEY SAND WITH LITTLE GRAVEL (VERY MOIST) (VERY DENSE)
	-	100/3"		BROWN FINE TO COARSE SANDY GRAVEL WITH CLAY (MOIST) (VERY DENSE)
	5	107		
45				
	-	100/5"	GC	(SATURATED)
	0	47		
50				

1. BORING COMPLETED TO A DEPTH OF 50 FEET ON 1/16/86.
2. NO DRILLING MUD USED.
3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/17/86.

BORING 108

SURFACE ELEVATION 209.18'

DEPTH IN FEET	OVA	BLOW COUNT / SAMPLES	SYMBOLS	DESCRIPTIONS
0	20	37		ASPHALT
			GC	BLACK SANDY CLAY AND ANGULAR GRAVEL (MOIST) (DENSE) (FILL)
	1000	10	SC	BLACK FINE TO COARSE CLAYEY SAND WITH SOME GRAVEL & SLAG (MOIST) (MEDIUM DENSE) (ORGANIC ODOR) (FILL)
	100+	6		BLACK SANDY CLAY, LITTLE FINE GRAVEL (WET) (SOFT) (STRONG ORGANIC ODOR)
5			CL	GRADING WITH MOTTLED YELLOW-BROWN CLAY
	20	3		GRADING BLACK COLOR
	135	* 22		
	72		CL	GRAY CLAY
	70			RED-BROWN CLAY, LITTLE GRAVEL (SLIGHTLY MOIST) (DENSE) (STRONG ORGANIC ODOR)
10	150	32	CL	GRADING WITH FINE TO MEDIUM SAND
	88	111		RED-BROWN CLAYEY SAND (SLIGHTLY MOIST) (VERY DENSE) (STRONG ORGANIC ODOR)
			SC	
	18	58		RED-BROWN SANDY CLAY, TRACE FINE GRAVEL (SLIGHTLY MOIST) (DENSE) (STRONG ORGANIC ODOR)
15			CL	
20				

1. BORING COMPLETED TO A DEPTH OF 16 FEET ON 1/17/86.
2. NO DRILLING MUD USED.
3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/17/86.

LOG OF BORINGS

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BORING 104

SURFACE ELEVATION 203.08'

DEPTH IN FEET	OVA	BLOW COUNT	SAMPLES	SYMBOLS	DESCRIPTIONS
0		16		CL	ASPHALT RED-BROWN CLAY WITH LITTLE SAND & GRAVEL (MOIST) (MEDIUM DENSE)
		28			
5	360	26		CL	GRAY-BROWN SILTY CLAY (STRONG ORGANIC ODOR)
				CL	GRAY CLAY (OIL SATURATED)
	360	*61		CL	BROWN-RED CLAY, LITTLE COARSE SAND & VERY FINE GRAVEL (VERY STRONG ORGANIC ODOR)
10	340	42			
	760	78			
	1000+	78			
15	900	54		SP	BROWN FINE TO MEDIUM SAND, TRACE SILT, TRACE ANGULAR GRAVEL (DRY) (DENSE) (STRONG ORGANIC ODOR) STRATIFIED FINE & COARSE SAND LAYERS
	1000+	*76		SW	FINE TO COARSE SAND, LITTLE FINE GRAVEL (SLIGHT ODOR)
20	48	62			
	89	70			
	66	110		SW-GW	BROWN GRAVELY MEDIUM TO COARSE SAND, TRACE SILT (DRY) (VERY DENSE)
25	84	100			
	68	61			(MOIST)
30	68	36		SP	BROWN FINE SAND, TRACE COARSE SAND & FINE GRAVEL (SLIGHTLY MOIST) (MEDIUM DENSE) (SLIGHT ODOR)
	92	50			
	98	58			GRADING WITH LENSES OF COARSE SAND
35	110	90			
	88	104		SM-GM	BROWN FINE SAND & GRAVEL, LITTLE SILT, SOME MEDIUM TO COARSE SAND (SLIGHTLY MOIST) (DENSE)
				CL	BROWN CLAY (VERY SLIGHTLY MOIST) (DENSE)
40	45	119		GW-SW	BROWN FINE TO COARSE SAND GRADING TO COARSE GRAVEL (SLIGHTLY MOIST) (VERY DENSE)
	25	81			
	20	40		SW	BROWN-RED BROWN FINE TO MEDIUM SAND (WET) (VERY DENSE) GRADING WITH GRAVEL
45					
50					

1. BORING COMPLETED TO A DEPTH OF 46 FEET ON 1/10/86.
2. NO DRILLING MUD USED.
3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/10/86.

BORING 105

SURFACE ELEVATION 209.26'

DEPTH IN FEET	OVA	BLOW COUNT	SAMPLES	SYMBOLS	DESCRIPTIONS
0	32	28		CL	ASPHALT BROWN-RED BROWN CLAY, TRACE TO LITTLE COARSE SAND & FINE GRAVEL (SLIGHTLY MOIST) (STIFF)
	56	11			
	72	20			GRADING YELLOW BROWN COLOR
5					
	74	26		CL-SC	BROWN-RED BROWN SANDY CLAY, TRACE FINE GRAVEL (SLIGHTLY MOIST) (DENSE)
	34	38			
10	38	85			GRADING WITH GRAVEL (FILL)
	16	94			
	50	138/11"		CL-SC	BROWN VERY FINE SAND & CLAY, TRACE FINE GRAVEL (MOIST) (VERY DENSE)
15					
	56	145/9"		SP	BROWN FINE TO MEDIUM SAND, TRACE COARSE SAND & TRACE FINE GRAVEL (MOIST) (VERY DENSE)
	20	59			GRADING WITH LITTLE COARSE SAND
20	44	57			GRADING STRATIFIED FINE & MEDIUM SANDS
	78	46			GRADING VERY MOIST
	74	64		SW	BROWN FINE TO COARSE SAND & FINE GRAVEL, LITTLE FINES (MOIST) (VERY DENSE)
25					
	50	62			
	46	62			
30	78	60			
	40	49			
	58	36			
35					
	52	39		SP	BROWN VERY FINE & FINE SAND (MOIST) (DENSE)
	62	35			GRADING WITH MEDIUM SAND & TRACE FINE GRAVEL
40	84	62		GC-SC	BROWN CLAYEY FINE TO COARSE SAND & ANGULAR FINE TO MEDIUM GRAVEL (MOIST) (VERY DENSE)
	150	*74			
45	99	71			
	100	61			
	78	78		SP	BROWN FINE TO MEDIUM SAND, STRATIFIED, LITTLE FINE GRAVEL (VERY MOIST) (VERY DENSE) GRADING WITH MORE GRAVEL & SATURATED
50	44	47			
	34	40			
55					

1. BORING COMPLETED TO A DEPTH OF 54 FEET ON 1/14/86.
2. NO DRILLING MUD USED.
3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/14/86.

LOG OF BORINGS

ATTACHMENT D

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FIGURE 9

BORING 101

SURFACE ELEVATION 204.31'

DEPTH IN FEET	SAMPLES: BLOW COUNT	SYMBOLS	DESCRIPTIONS
0	9	CL-SC	ASPHALT GRAY SANDY CLAY, TRACE GRAVEL (FILL)
5	8	SC	BROWN CLAYEY FINE TO COARSE SAND, TRACE FINE GRAVEL (WET) (SATURATED)
		CL	GRAY SANDY CLAY WITH ORGANIC MATERIAL (SOFT) (WET)
10	*2	SC-CL	GRADING WITH SOME ORGANIC MATTER & WOOD FRAGMENTS, TRACE FINE GRAVEL & ORGANIC ODOR RED CLAYEY SAND
15			1. BORING COMPLETED TO A DEPTH OF 13 FEET ON 1/6/86. 2. NO DRILLING MUD USED. 3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/6/86.

BORING 102

SURFACE ELEVATION 203.02'

DEPTH IN FEET	SAMPLES: BLOW COUNT	SYMBOLS	DESCRIPTIONS
0	7	SC	GRAY-BROWN FINE SAND WITH CLAY, TRACE FINE GRAVEL, TRACE ROOTS (MOIST) (MEDIUM DENSE)
5	1		GRADING WITH MORE CLAY
		CL	GRAY-RED MOTTLED CLAY WITH LITTLE VERY FINE SAND (VERY MOIST) (SOFT)
10	*23		GRADING WITH TRACE FINE GRAVEL (STIFF)
15			1. BORING COMPLETED TO A DEPTH OF 11 FEET ON 1/6/86. 2. NO DRILLING MUD USED. 3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/6/86.

BORING 103

SURFACE ELEVATION 209.99'

DEPTH IN FEET	OVA	SAMPLES: BLOW COUNT	SYMBOLS	DESCRIPTIONS
0			CL	ASPHALT
	2.5	22		GRAY-GREEN MOTTLED GRAVELLY CLAY, SOME ORGANIC MATERIAL
	4	54		TAN CLAY, SOME GRAVEL & ROOT FRAGMENTS WITH ROCK FRAGMENTS (MOIST) (STIFF)
	70	51		GRADING WITH GRAVELLY LENSES & DARKER BROWN COLOR
5	4	* 73	CL	GRADING WITH LITTLE FINE TO MEDIUM SAND (MOIST)
	25	105		
10	3	74		
	8	120		GRADING WITH SOME FINE SAND LENSES
	2	62		
15	3	108		BROWN FINE CLAYEY SAND (VERY SLIGHTLY MOIST) (DENSE)
	3	100/6"		GRADING WITH SOME FINE TO MEDIUM GRAVEL
20	6	190	SC-CL	
		100/1"		GRADING WITH COBBLES
		100/2"		
25	4	35/1"		
	4	41	SW	RED-BROWN FINE TO MEDIUM SAND, TRACE FINE GRAVEL (SLIGHTLY MOIST) (DENSE)
30	10	52		GRADING WITH GRAVEL
	8	134/8"		RED-BROWN FINE SAND, LITTLE FINE GRAVEL (SLIGHTLY MOIST) (DENSE)
	12	100/3"		
35	10	130/7"	SP	
	4	145/9"		GRADING WITH STRATIFIED FINE & COARSE SAND AND TRACE FINE GRAVEL
40	100+	155/9"	SW	BROWN FINE TO COARSE SAND & FINE GRAVEL, TRACE CLAY (SLIGHTLY MOIST) (VERY DENSE)
	6	148/9"		BROWN FINE TO MEDIUM SAND, TRACE FINE GRAVEL (SLIGHTLY MOIST)
	15	140/10"		GRADING WITH STRATIFIED COARSE SAND LAYERS
45	42	155/9"	SP	
	18	100		GRADING WET
50	2	75		
			GP	COARSE GRAVEL & ROCK FRAGMENTS (WET)
55				1. BORING COMPLETED TO A DEPTH OF 52 FEET ON 1/9/86. 2. NO DRILLING MUD USED. 3. BORING BACKFILLED WITH BENTONITE/CEMENT GROUT, TREMIE PIPE METHOD, ON 1/9/86.

LOG OF BORINGS

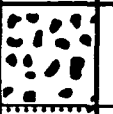
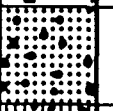
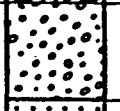
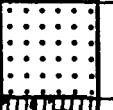
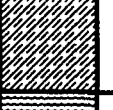
NOTES:

1. THE FIGURES IN THE COLUMN LABELED "BLOW COUNT" REFER TO THE NUMBER OF BLOWS REQUIRED TO DRIVE A STANDARD SPLIT-SPOON SAMPLER A DISTANCE OF ONE FOOT USING A 140 POUND DRIVE WEIGHT FALLING 30 INCHES. THE STANDARD SPLIT-SPOON SAMPLER IS 2" O.D. AND 1-3/8" I.D.
2. AN ASTERISK IN THE "BLOW COUNT" COLUMN INDICATES THAT THIS SAMPLE WAS DELIVERED TO THE ETC FOR CHEMICAL ANALYSIS.
3. THE FIGURES IN THE COLUMN LABELED "OVA" REFER TO THE READING OF VAPORS IN THE HEAD SPACE OF A SAMPLE JAR WHICH HAD BEEN COVERED WITH FOIL AND HEATED IN AN OVEN. READINGS MEASURED BY A FOXBORO MODEL 128 ORGANIC VAPOR ANALYZER.

ATTACHMENT 2

Dames & Moore

FIGURE 2

MAJOR DIVISIONS			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS — MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS — MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS — LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS — LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

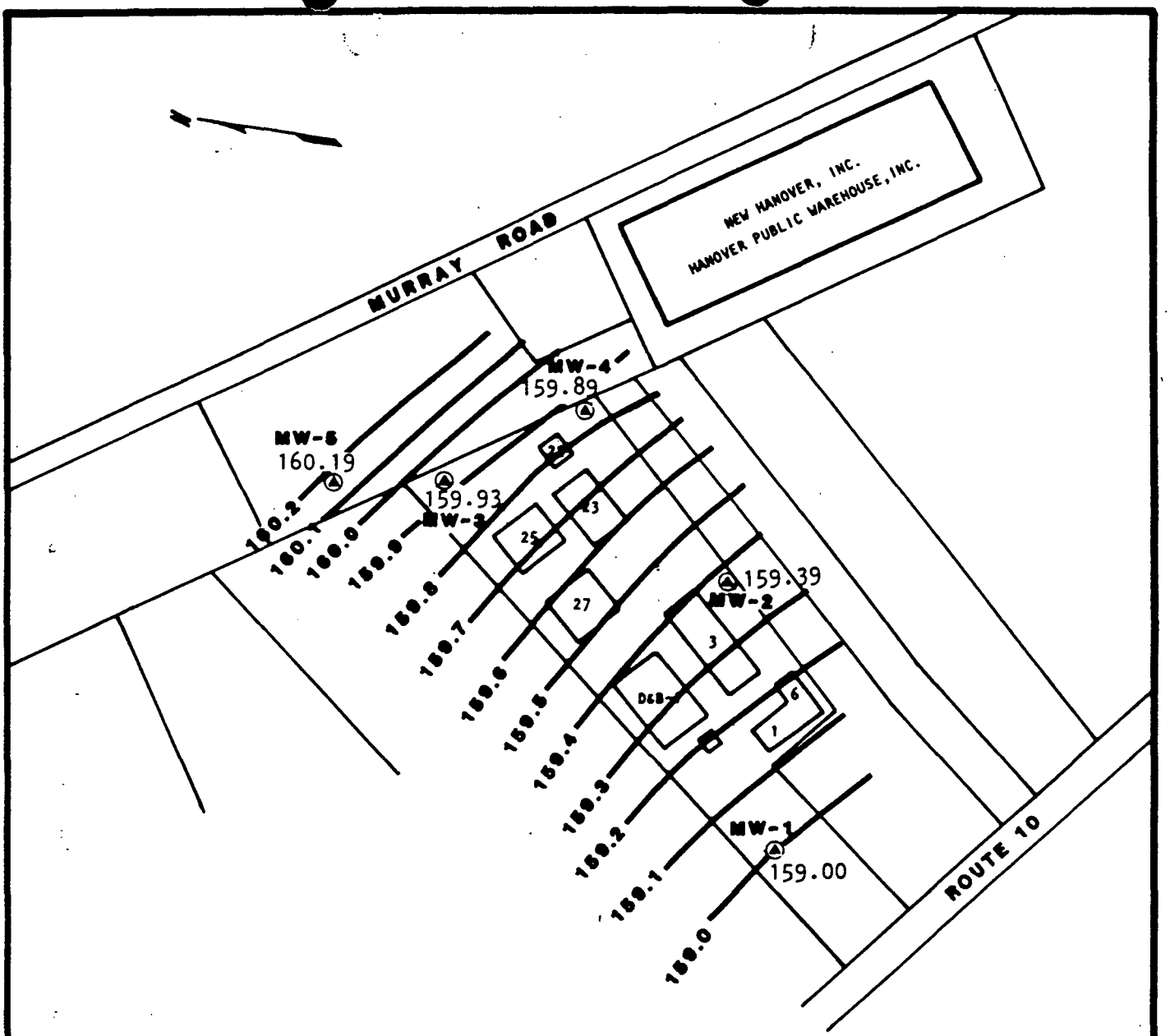
NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

ATTACHMENT D

DAMES & MOORE

FIGURE 7



GROUND WATER ELEVATION CONTOUR MAP

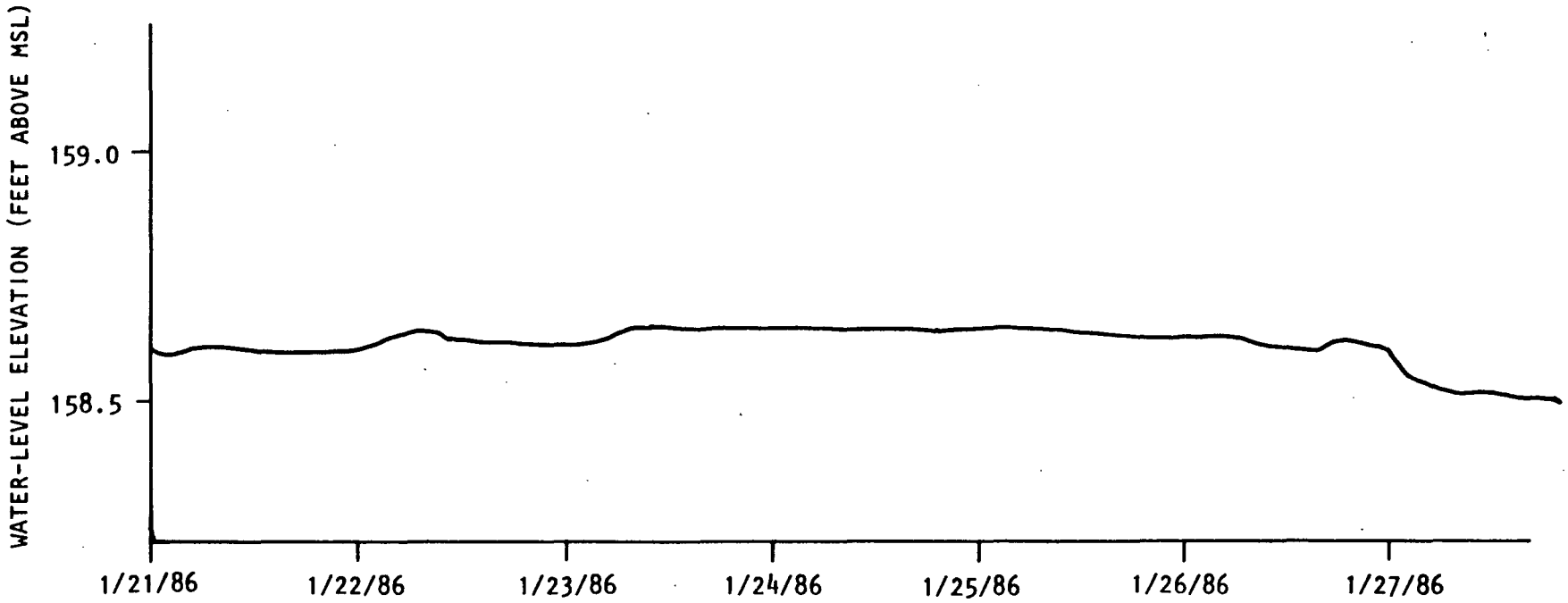
ADRON - EAST HANOVER, N.J.

K E Y:

- ⊙ APPROXIMATE LOCATION OF MONITORING WELL INSTALLED PREVIOUSLY BY DAMES & MOORE
- 159.3 —— GROUND WATER ELEVATION CONTOUR (CONTOUR INTERVAL = .1 FOOT)
- 159.89 WATER LEVELS AS RECORDED ON JAN. 7, 1986

ATTACHMENT D

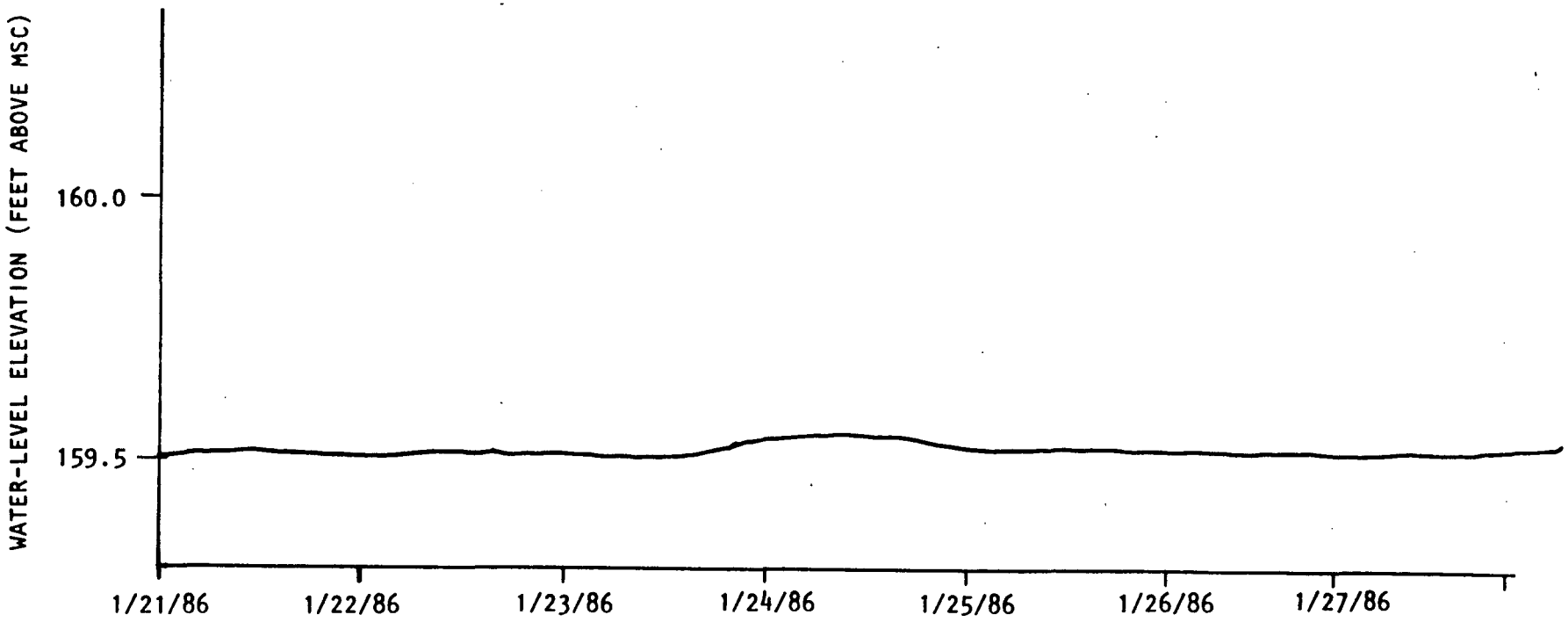
DAMES & MOORE



HYDROGRAPH
MW-1
ADRON, INC.
EAST HANOVER, NJ

ATTACHMENT D

BARNES & MOORE

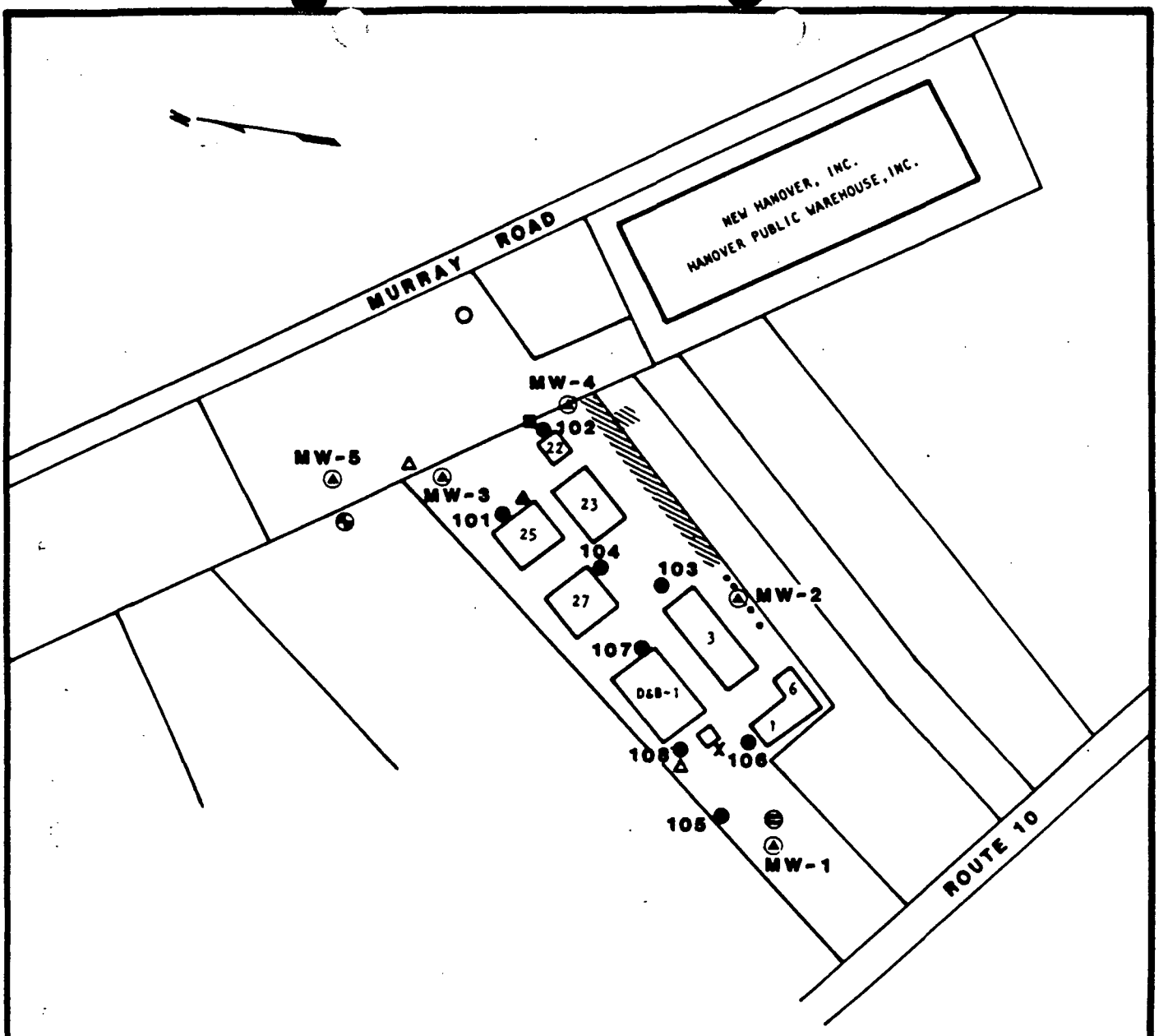


HYDROGRAPH

MW-4

ADRON, INC.
EAST HANOVER, NJ

ATTACHMENT 2



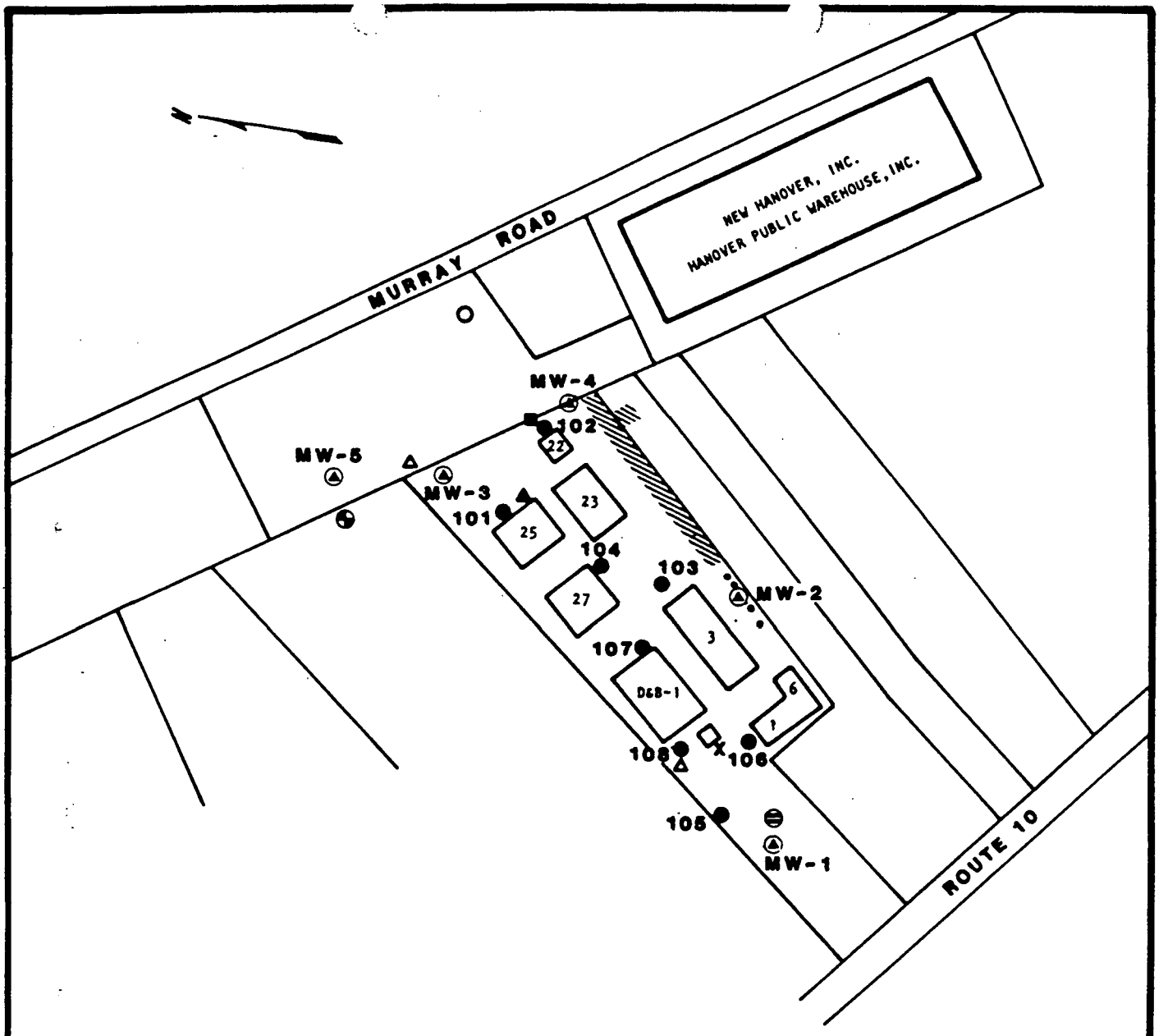
SITE PLAN
AREA DESIGNATIONS
ECRA SAMPLING PLAN
ADRON - EAST HANOVER, N.J.

K E Y:

⊛	MONITORING WELL INSTALLED PREVIOUSLY BY DAMES & MOORE
105 ●	AREAS S-1, S-2 & S-3
■	AREA S-4
◔	AREA S-5
○	AREA S-5
▨	AREA S-6
••••	AREA S-7
△	AREA S-8
▲	AREA S-9
x	AREA S-10
●	AREA A

ATTACHMENT D

DAMES & MOORE



PLOT PLAN

APPROXIMATE SAMPLING POINT LOCATIONS

ECRA SAMPLING PLAN

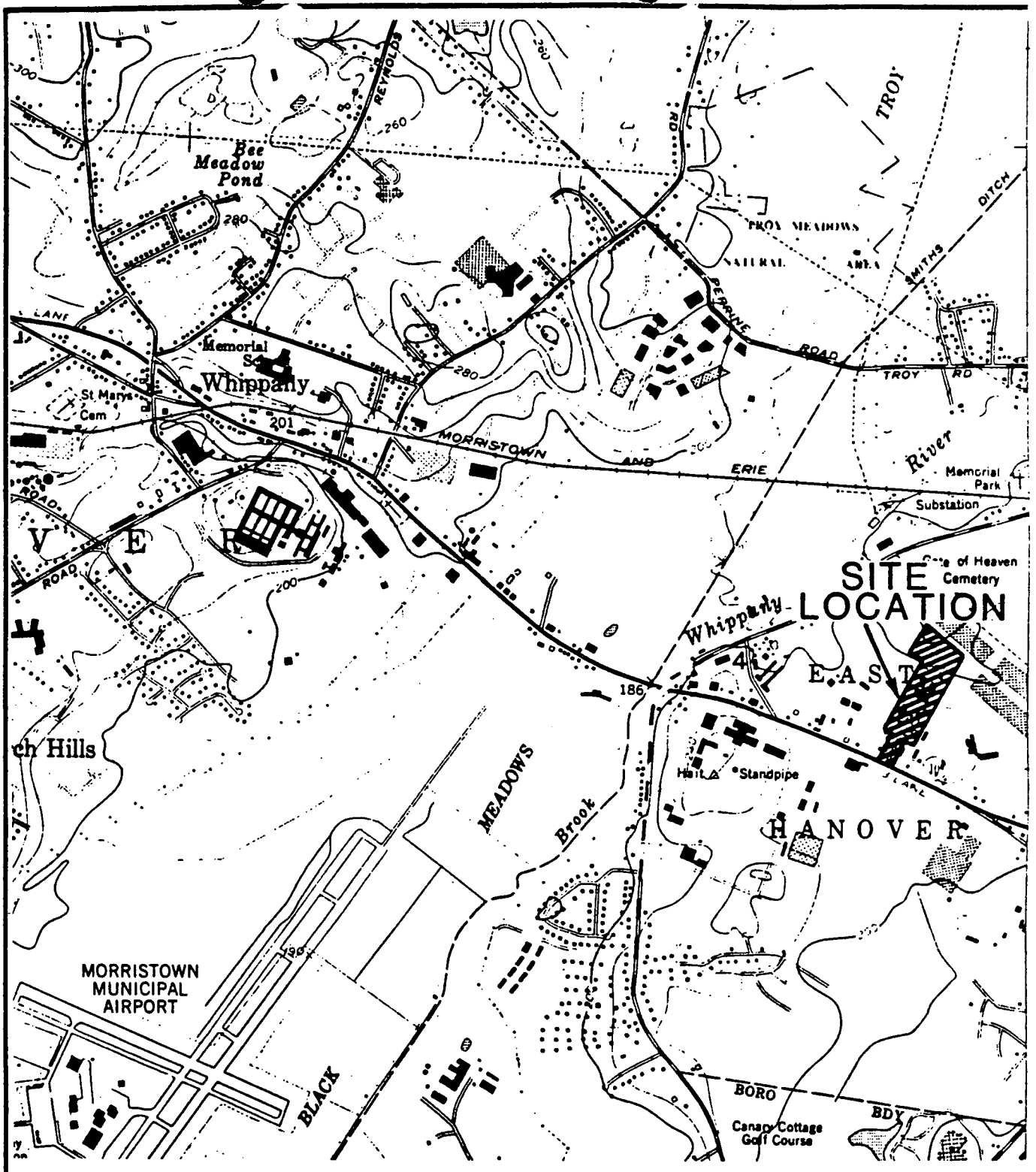
ADRON - EAST HANOVER, N.J.

K E Y:

- ⊛ MONITORING WELL INSTALLED PREVIOUSLY BY DAMES & MOORE
- 105 ● BORING & SOIL SAMPLING LOCATION AT SUMPS AND SEPTICS
- x SEDIMENT SAMPLE AT VEHICLE MAINTENANCE BUILDING
- △ SEDIMENT SAMPLES AT CATCH BASINS
- ■ SOIL SAMPLE AT DRUM CLEANING AREA
- ▲ SOIL SAMPLES AT DUMPSTER
- ◒ WATER SAMPLE FROM STREAM/SEEP
- ⊜ SOIL SAMPLE AT SOUTHERN PLANT ENTRANCE
- O SOIL SAMPLE AT TEST PIT 102
- ▨ DRUM DISPOSAL AREA
- •••• SOIL SAMPLES FOR COMPOSITES ALONG PLATFORM 7

ATTACHMENT D

DAMES & MOORE



SITE LOCATION MAP

ECRA SAMPLING PLAN
ADRON - EAST HANOVER, N.J.

ATTACHMENT 1

MAP TAKEN FROM USGS TOPOGRAPHIC MAP,
MORRISTOWN QUADRANGLE

DAMES & MOORE

APPENDIX A

FIELD INVESTIGATION

The field investigation was performed during the period of January 6 through January 21, 1986 in accordance with the approved Sampling Plan. During the field investigation, eight borings were advanced to depths ranging from 11 to 54 feet below existing grade, 17 soil/sediment samples obtained, one water sample obtained and one field blank taken.

Drilling services were provided by Environmental Drilling, Inc. of Mt. Arlington, New Jersey, using a Mobil Model B-61 hollow stem auger rig. Continuously sampled borings were advanced to final depths whereupon the borehole was backfilled with a bentonite cement slurry using the tremie pipe method. drilling was performed under the supervision of a Dames & Moore geologist who logged all borings. Prior to starting drilling operations and in between each boring location, the drill rig and all downhole tools and equipment were steam cleaned to pevent potential cross contamination. Split spoon samplers used to collect soil samples were washed in a TSP solution and liberally rinsed with distilled water between each use. decon. method NG

Soil samples were gently transferred from split spoons and stored in both laboratory provided glassware and clean sample jars. Samples were screened using a Foxboro Organic Vapor Analyzer, and on the basis of this screening, samples were selected for analysis by Environmental Testing and Certification of Edison, New Jersey. Samples were stored in ice coolers until delivered to the laboratory.

Additional soil sampling utilized clean disposable trowels. Soil and sediment was collected in the trowells and gently transferred into laboratory provided glassware. All sampling was performed by an experienced and qualified Dames & Moore geologist.

A water sample collected from the seep/stream passing through Area S-5 was also collected. Sample containers wre carefully placed under the stream surface and allowed to slowly fill with water. Samples were then fixed with the necessary

ATTACHMENT D

APPENDIX B

preservatives. Disposable PVC gloves were worn during all sampling activities in order to prevent potential contamination of sample media.

The ground surface elevation at each boring site was surveyed by Professional Association on February 22, 1986. Water level elevations were recorded in all monitoring wells to the nearest .01 foot using a calibrated Soil Instrument electric water level indicator. In addition, Stevens Type F water level recorders were installed on Monitoring Well Nos. 1 and 4. Water levels were recorded continuously in these wells for approximately one week.

Twenty test pits were excavated in the area between Murray Road and the plant's fence line. Excavations were performed by a backhoe and operator supplied by Adron, Inc., under the observation of a Dames & Moore engineer. The engineer located and logged all test pits as well as collecting a soil sample from test pit No. 102.

ATTACHMENT D

TABLE B-1

SUMMARY OF ANALYSES

GROUND WATER SAMPLES OBTAINED IN 1984

AREA DESIGNATION B

PPF/NORDA SITE

EAST HANOVER, NEW JERSEY

Parameter	ETC MW-1	NYT MW-1	ETC MW-2	ETC MW-3	NYT MW-3	ETC MW-4	NYT MW-4	ETC MW-5	NYT MW-5
Priority Pollutant Volatile Organic Compounds									
Trichloroethylene	BMDL		115	BMDL	< 10			BMDL	
Toluene	BMDL	< 10			< 10		< 10		
Methylene Chloride	BMDL	25			< 10	BMDL	11	BMDL	11
1,2-Dichloroethane	47	15				51	95		
Chloroform	26	51							
Carbon Tetrachloride	30	69							
1,2-Trans-Dichloroethylene			BMDL	BMDL					
Tetrachloroethane	34			BMDL		BMDL			
1,1,1-Trichloroethane	BMDL					BMDL		24	
Chlorobenzene				BMDL					
Priority Pollutant Acid Compounds									
Pentachlorophenol					30				
Priority Pollutant Base/Neutral Compounds									
Di-n-octyl phthalate								BMDL	< 10
Diethyl phthalate				BMDL	< 10				
Bis(2-ethylhexyl) phthalate								BMDL	< 10
Metals, Cyanide and Phenols									
Antimony	BMDL	< 100			< 100		< 100		< 100
Arsenic	BMDL	< 1	BMDL	BMDL	< 4	BMDL	< 1	7.00	3
Beryllium		< 3			< 3		< 3		< 3
Cadmium		< 3			< 3		< 3		< 3
Chromium		< 10			< 10		< 10	BMDL	< 10
Copper	BMDL	< 20	BMDL		< 20		< 20		< 20
Lead		< 25			< 25		< 25		< 25
Mercury		0.1			0.3		0.4		0.2
Nickel		< 20		BMDL	20	BMDL	< 20		< 20
Selenium	BMDL	1	BMDL	BMDL	< 1		3		2
Silver		< 6			< 6		< 6		< 6
Thallium		< 50	BMDL		< 50		< 50	BMDL	< 50
Zinc	BMDL	34	BMDL	7.00	24	15	8	BMDL	50
Cyanide, Total	26	< 20	< 25	< 25	< 20	< 25	< 20	< 25	< 20
Phenolics, Total	< 50	< 2	< 50	61	< 2	< 50	< 2	< 50	< 2

NOTES:

1. Concentrations are in parts per billion (ppb).
2. Results are from New York Testing Laboratories (NYT) and Environmental Testing & Certification (ETC).
3. *Tentatively Identified Compounds are those identified in "Plus 40" library search. Concentrations are estimated and not integrated on the basis of injection of standard solutions.
4. Only those compounds detected are listed. Blank space indicates compounds not detected in that sample.
5. See Figure 6 for well locations.
6. Samples obtained and analyzed in 1984.

ATTACHMENT D

TABLE B-1 (continued)

TENTATIVELY IDENTIFIED AND QUANTIFIED COMPOUNDS

GROUND WATER SAMPLES OBTAINED IN 1984

AREA DESIGNATION B

PPF/NORDA SITE

EAST HANOVER, NEW JERSEY

Parameter	ETC MW-1	NYT MW-1	ETC MW-2	ETC MW-3	NYT MW-3	ETC MW-4	NYT MW-4	ETC MW-5	NYT MW-5
Tentatively Identified Volatile Compounds*									
Hexane									36
2 Propanol									19
1,1-OxyBisethane				308			1200		
Ethyl Hexanol					7				
Trimethyl Benzene					4				
1,3-Dimethyl Benzene					20		14		
2-Butanone					5		4		4
2-Propanone					310		470		1800
2,2-OxyBispropane					72				
1-1, OxyBismethane					4500				
Oxybisethane						125			
Tentatively Identified Acid Compounds*									
Cyclotetra Siloxane, Octamethyl								12	
Pentyl Cyclopropane								16	
Dodecamethyl Pentasiloxane								148	
Dodecanoic Acid								216	
3 Unknowns								40-90	
Tetra Deconoic Acid								17	
1H-Purin-6-Amine (2 Fluorophenyl) methyl								35	
Biphenylene						27			
2 Unknowns			16-41						
1,3,5,-Triazine-2,,4,6 (1H, 3H, 5H)-Trione, 1,3,5-Trimeth			16						
Tentatively Identified Base/Neutral Compounds*									
5 Unknowns						21-85			
1H-Indole, 2-phenyl-i-trimethyl silyl						1033			
Dioctylester Hexanedioic Acid						20			
5 Unknowns				15-45					
Benzoic Acid, 4-Methoxy, trimethylsilyl ester				93					
Dodecanoic Acid				23					
Hexanedioc Acid Dioctyl Ester		65		239					
Acetic Acid (aminooxy)			29						
5 Unknowns			27-143						
6 Unknowns		17-66							
1,3-Dioxolane, 2 pentadecyl		17							

NOTES:

1. Concentrations are in parts per billion (ppb).
2. Results are from New York Testing Laboratories (NYT) and Environmental Testing & Certification (ETC).
3. *Tentatively Identified Compounds are those identified in "Plus 40" library search. Concentrations are estimated and not integrated on the basis of injection of standard solutions.
4. Only those compounds detected are listed. Blank space indicates compounds not detected in that sample.
5. See Figure 6 for well locations.

ATTACHMENT D

TABLE B-2

SUMMARY OF ANALYSIS

COMPOSITE NO. 1 SOIL SAMPLE

AREA DESIGNATION S-7 (PLATFORM 7)

PPF/NORDA SITE

EAST HANOVER, NEW JERSEY

Parameter	Soil Composite 1	
Priority Pollutant Volatile Compounds		
Chlorobenzene	2400	
Methylene Chloride	BMDL	
Tetrachloroethylene	194	
Toluene	3230	
Priority Pollutant Base/Neutral Compounds		
Anthracene	BMDL	
Fluoranthene	BMDL	
Metals, Cyanide and Phenols		
Antimony		
Arsenic	9.30	ppm
Beryllium	1.00	ppm
Cadmium		
Chromium	31	ppm
Copper	28	ppm
Lead	42	ppm
Mercury	BMDL	
Nickel	20	ppm
Selenium	BMDL	
Silver		
Thallium	.90	ppm
Zinc	100	ppm
Cyanide, Total	< .50	ppm
Phenolics, Total	.60	ppm

NOTES:

1. Concentrations are in parts per billion (ppb) unless otherwise noted.
2. Results are from Environmental Testing & Certification (ETC).
3. Only those compounds detected are listed. Sample analyzed for full priority pollutants with "Plus 40" library search.

ATTACHMENT 2

TABLE 4

SUMMARY OF ANALYSES

ECRA SAMPLING PLAN

AREA DESIGNATIONS S-1, A

	AREA DESIGNATION		
	S-1	S-5	S-A
	SAMPLE IDENTIFICATION		
	TP-102	RSTRM	SLAWN
Priority Pollutant Volatile Compounds			
Methylene Chloride	16.1	BMDL	77.7
Toluene	BMDL		
Tentatively Identified Volatile Compounds			
Carbon Dioxide	•(1)		•(1)
Tentatively Identified Acid Compounds			
Tetrachloroethene		•(1)	•(1)
Alkene	•		
6 Unknowns	•		
2 Alkanes		•(1)	
Methyl Phenol		•	
Benzene Acetic Acid		•	
Benzenepropanoic Acid		•	
8 Unknowns		•	
Hexane			•
3 Methylpentane			•(1)
Methylcyclopentane			•(1)
Cyclohexene			•(1)
3 Methyl hexane			•
3 Unknowns			•
Unknown			•(1)
Tentatively Identified Base/Neutral Compounds			
Alkene	•		
2 Unknowns	•		
4 Methyl 2-Pentanone		•	
Tetrachloroethene		•	
Alkane		•	
Alkene		•	
5 Unknowns		•	
1-Cyclopropylethanone		•	
3 Hexen-2-One		•	
Decane		•(1)	
6 Unknowns		•	
1 Unknown		•	
Cyanide and Phenols			
Phenolics, Total	.1 (ppm)	50	100
Cyanide, Total	.5 (ppm)	25	500
Priority Pollutant Metals			
Antimony	ND	ND	ND
Arsenic	2,000	ND	4,000
Beryllium	ND	ND	500
Cadmium	ND	ND	700
Chromium	39,000	ND	25,000
Copper	31,000	ND	15,000
Lead	BMDL	ND	15,000
Mercury	ND	ND	ND
Nickel	24,000	ND	17,000
Selenium	BMDL	5	ND
Silver	ND	ND	ND
Thallium	BMDL	BMDL	BMDL
Zinc	70,000	30	48,000

NOTES:

1. Concentrations are in ug/kg (parts per billion).
2. Blank space indicates compound not detected in that sample.
3. • denotes compound tentatively identified in library search.
4. •(1) denotes compound also detected in blank.
5. Samples analyzed for full priority pollutants with "Plus 40" library search.
6. Refer to Figures 2 and 11 and Appendix B for sample locations.

ATTACHMENT D

TABLE 3

SUMMARY OF ANALYSIS

ECRA SAMPLING PLAN

AREA DESIGNATIONS S-4, S-8, S-9 AND S-10

	AREA DESIGNATION					
	S-4	S-9	S-9	S-8	S-8	S-10
	SAMPLE IDENTIFICATION					
	DRCL	SDUM	NDUM	SCB	NCB	VM
Priority Pollutant Volatile Compounds						
Methylene Chloride	107	79.9	166	181	148	481
Toluene				BMDL		33.4
Petroleum Hydrocarbons					370 (ppm)	
Tentatively Identified Volatile Compounds						
Carbon Dioxide		*(1)	*(1)	*(1)	*(1)	*(1)
Unknown				*		
Methyl Methyl ethyl cyclohexane		*			*	
Unknown					*	

NOTES:

1. Concentrations are in ug/kg (parts per billion) unless otherwise noted.
2. Blank space indicates compound not detected in that sample.
3. * denotes compound tentatively identified in library search.
4. *(1) denotes compound also detected in blank.
5. Sample "NCB" analyzed for priority pollutant volatile compounds with "Plus 15" library search and petroleum hydrocarbons. Other samples analyzed for priority pollutant volatile compounds with "Plus 15" library search only.
6. Refer to Table 1 for sample description and location.
7. Refer to Figure 2 for sample locations.

ATTACHMENT D

TABLE 2

SUMMARY OF ANALYSIS

ECRA SAMPLING

AREA DESIGNATIONS S-1, S-2 AND S-3

ADRON, EAST HANOVER, NEW JERSEY

		AREA DESIGNATION								
		S-1	S-1	S-2	S-1	S-2	S-2	S-2	S-2	S-3
		SAMPLE IDENTIFICATION								
	Field Blank	SB101S3	SB102S3	SB103S4	SB104S4	B104S9	S-22	B106S9	B107-S19	B108-S5
Priority Pollutant Volatile Compounds										
Benzene										134
Ethylbenzene										229
Methylene Chloride	21.6		18.0	143		159	162	193	BMDL	171
Toluene					62.5				BMDL	3,110
Tentatively Identified Volatile Compounds										
Unknown			*(1)							
Unknown		*(1)								
Unknown				*(1)						
Unknown					*					
Cyclohexene, 1-methyl-4-(1-methylethenyl)					*					
Carbon dioxide						*(1)	*(1)	*(1)	*(1)	
4 Unknowns						*				
Alkane						*				
2-Propanone								*	*	*
4 Unknowns										*
1,3,3-trimethyl-2-oxabicyclo (2.2.2.) octane										*
1,3,3-trimethyl-bicyclo (2.2.1) heptan-2-one										*
1,7,7-trimethyl-bicyclo (2.2.1) heptan-2-one										*
3,3,5-trimethylcyclo hexanone										*

NOTES:

1. Concentrations are in ug/kg (parts per billion).
2. Blank space indicates compound not detected in that sample.
3. * denotes compound tentatively identified in library search.
4. *(1) denotes compound also detected in blank.
5. Samples analyzed for priority pollutant volatile compounds with "Plus 15" library search.
6. Refer to Table 1 for sample description.
7. Refer to Figures 2, 8, 9 and 10 for sample locations.

ATTACHMENT D

TABLE 1

ECRA SAMPLING PLAN

SAMPLE SUMMARY

ADRON, INC.

EAST HANOVER, NEW JERSEY

Sample Point Identification	Area Designation	Sample Description	Sample Location
Field Blank		Water Sample for Quality Assurance	Collected at Boring 108
SB 101S3	Area S-1	Soil Sample at Sump Bldg. 25	Boring 101, 12-13 ft. below grade
SB 102S3	Area S-1	Soil Sample at Sump Bldg. 22	Boring 102, 9½-10 ft. below grade
SB 103S4	Area S-2	Soil Sample at Septic Tank Bldg 3	Boring 103, 6-8 ft. below grade
SB 104S4	Area S-1	Soil Sample at Sump Bldg. 27	Boring 104, 9-9½ ft. below grade
B104	Area S-2	Soil Sample for Septic Bldgs. 23, 25 and 27	Boring 104, 18-20 ft. below grade
S-22	Area S-2	Soil Sample for Septic Bldgs. D and B-1 and Vehicle Maintenance Bldg.	Boring 105, 42-44 ft. below grade
B106S9	Area S-2	Soil Sample for Septic Bldg. #1	Boring 106, 16-18 ft. below grade
B 107 -S19	Area S-2	Soil Sample for Septic Bldgs. D and B-1	Boring 107, 36-38 ft. below grade
B 108 -S5	Area S-3	Soil Sample from Fire Pond	Boring 108, 9-10 ft. below grade
DRC	Area S-4	Soil Sample from Drum Cleaning Area	Drum Cleaning Area northeast of Bldg 22, 2 ft. below grade
SDUM	Area S-9	Soil Sample Below Southern End of Dumpster	Dumpster northwest of Bldg 22
NDUM	Area S-9	Soil Sample Below Northern End of the Dumpster	Dumpster northwest of Bldg 22
SCB	Area S-8	Soil/Sediment Sample from Catch Basin	Catch basin north of vehicle Vehicle Maintenance Bldg along western plant boundary
VM	Area S-10	Soil/Sediment Sample from Catch Basin at Vehicle Maintenance Bldg	Catch basin at southern end of Vehicle Maintenance Bldg.
NCB	Area S-8	Soil/Sediment Sample from Catch Basin	Catch basin north of fence corner at northwest corner of plant
SLAWN	Area A	Soil Sample	Grassy area near southern entrance to plant.
RSTRM	Area S-5	Water Sample from Stream/Seep	Seep entering wooded area northwest of MW-5.
TP102	Area S-5	Soil Sample	Test Pit 102 8 feet below grade.

NOTES:

1. Refer to Figure 2, 8, 9 and 10 for sample locations.
2. Refer to Tables 2, 3 and 4 for results of chemical analysis.

ATTACHMENT D

APPENDIX B

DESCRIPTION OF PROCESSES RUN AT NORDA'S EAST HANOVER FACILITY

Norda, Inc. supplies raw materials and other ingredients to customers in the flavor, fragrance and aroma industry. Descriptions of the processes run at its East Hanover plant are set forth below:

1. RESALE AND REPACKAGING OF PURCHASED GOODS- Norda's commodities division purchases, and then resells ingredients used in the manufacture of flavors and fragrances. From time to time, it is necessary to repackage these materials.

2. LIQUID/LIQUID BLENDING OF PERFUME AND AROMA CHEMICALS- By a process known as "compounding", Norda mixes various chemicals and essential oils at room temperature to produce the final product.

3. EXTRACTION OF NATURAL FRUITS AND VEGETABLES- Norda extracts natural fruits and vegetables such as apricots, strawberries, blackberries and vanilla beans with isopropanol or ethanol. After the solids are separated by filtration, the alcoholic solution containing the flavor component is concentrated by distillation. The distillate is recovered and re-used in future extractions.

4. DISTILLATION OF FLAVOR OILS- Norda purchases oils from extracts of orange, lemon, lime, grapefruit, spearment and peppermint. These oils are further purified and "dewaxed" at the Norda facility by fractional distillation. The resulting products are either packaged and sold, or used to produce other flavor compounds.

5. LIQUID/LIQUID BLENDING OF FLAVOR MATERIALS- This process is conducted in the same manner as described above for liquid/liquid blending of perfume and aroma chemicals. The only difference in the processes is the type of starting materials used.

6. LABORATORIES FOR RESEARCH AND DEVELOPMENT AND QUALITY CONTROL- Norda operates several small laboratories whose primary function is to provide quality control data in support of the above processes. These laboratories also develop new formulations for Norda products.

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APPENDIX B, CONT.

7. HANDLING OF WASTE- Aqueous waste is generated at the Norda facility when equipment is washed before a change is made to a new process. This wash water is collected in sumps located near the manufacturing buildings. Thereafter, it is pumped to above-ground, indoor tanks for storage until it is removed as nonhazardous waste.

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APPENDIX "C"
Reference Question 11A

Description of Storage Tanks

Tank No.	Capacity	Contents	Material of Construction	Above or Below Ground	Age	Location
G-1	2,000 gal	Regular Gas	Steel	B	11 yrs	Yard
G-2	2,000 gal	Unleaded Gas	Steel	B	6 yrs	Yard
D-1	2,000 gal	No. 2 Diesel	Steel	B	15 yrs	Yard
F-1	10,000 gal	No. 6 Fuel Oil	Steel	B	22 yrs	Bldg. 3
F-2	20,000 gal	No. 6 Fuel Oil	Steel	B	12 yrs	Bldg. 3
F-3	10,000 gal	No. 4 Fuel Oil	Steel	B	18 yrs	Bldg. 23
IPA-1	3,000 gal	Iso Propyl Alcohol	Stainless Steel	B	18 yrs	Bldg. 22
IPA-2	3,000 gal	Iso Propyl Alcohol	Stainless Steel	B	18 yrs	Bldg. 22
ST-1	7,500 gal	d'Limonene	Steel	A	15 yrs	Yard
ST-2	7,500 gal	d'Limonene	Steel	A	15 yrs	Yard
ST-3	20,000 gal	d'Limonene	Steel	A	18 yrs	Yard
ST-4	20,000 gal	d'Limonene	Steel	A	20 yrs	Yard
ST-5	12,500 gal	d'Limonene	Steel	A	18 yrs	Yard
35	2,800 gal	Vanilla Extract	Stainless Steel	A	35 yrs	Bldg. 23
36	2,800 gal	Vanilla Extract	Stainless Steel	A	35 yrs	Bldg. 23
37	6,000 gal	Vanilla Extract	Stainless Steel	A	19 yrs	Bldg. 23
45	10,800 gal	Vanilla Extract	Stainless Steel	A	15 yrs	Bldg. 23

In addition to the above listed outside storage tanks, are storage tanks inside production buildings. These tanks are all of welded stainless steel construction and are hung from steelwork allowing them to be off the floor and easily inspected at all times.

Bldg.	Number of Tanks	Capacity Range	Products	Age
22	19	950 gal each	Flavors/Extracts	26 yrs
23	40	400 to 5,000 gal	Flavors	19 yrs
27	7	500 to 750 gal	Perfumes	12 yrs

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INSIDE DRUM STORAGE

1. D&B Main Warehouse
2. Bldg. 1
3. Bldg. 6
4. Bldg. 3
5. Bldg. 25 Warehouse
6. Bldg. 27 Warehouse

ATTACHMENT E

APPENDIX D

Norda has retained Fairfield Maintenance Company to perform leak tests on all of its underground tanks. These tests have been performed, and Norda is awaiting receipt of the results. Based upon verbal communications, all of the tanks passed the petrotite test.

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APPENDIX E

COMMERCIAL HAZARDOUS SUBSTANCES

Note: HC = Fragrance Division
HF = Flavor Division
HX = Commodities Division

Material	CAS Number	Quantity	Location
Acetaldehyde	75-07-0	89.29 lb.	HF
Acetic Acid	64-19-7	3,538.53 lb.	HF
Acetic Anhydride	108-24-7	35.0 lb.	Lab
Acetone	67-64-1	30.0 lb.	Lab
Acetyl Methyl Carbinol	513-86-0	62.51 lb.	HF
Alpha Pinene	80-56-8	1,294.56 lb.	HC & HF
Amyl Alcohol	74-41-0	6,375.42 lb.	HC & HF
Anisole	100-66-3	112.88 lb.	HX
Benzaldehyde	100-52-7	14,307.11 lb.	HC, HF & HX
Benzoic Acid	65-85-0	50.22 lb.	HC
Borneol	507-70-0	87.19 lb.	HC
Butyl Formate	592-84-7	10.0 lb.	HF
Butyraldehyde	123-72-8	367.36 lb.	HC & HF
Butyric Acid	107-92-6	1,015.28 lb.	HC & HF
Camphene	79-92-5	317.09 lb.	HC
Camphor	76-22-2	857.46 lb.	HC, HF & HX
Camphor Oil	8008-51-2	1,312.57 lb.	HC, HF & HX
Caproic Acid	142-61-1	335.09 lb.	HC & HF
Carbon Black		800.00 lb.	HF
Carbon Tetrachloride	56-23-5	10.00 lb.	Lab
Chloroform	67-66-3	30.00 lb.	Lab
Cymene	25155-15-1	508.90 lb.	HC

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Material	CAS Number	Quantity	Location
Diethyl Phthalate	84-66-2	8,240.32 lb.	HC
Dimethyl Disulfide	624-92-0	0.24 lb.	HC
Dimethyl Phthalate	131-11-3	405.23 lb.	HC
Di Pentene	138-86-3	5,101.30 lb.	HC, HF & HX
Ethyl Acetate	141-78-6	4,026.79 lb.	HC & HF
Ethyl Alcohol	64-17-5	41,997.55 lb.	HF
Ethyl Amyl Ketone	106-67-3	44.28 lb.	HC, HF & HX
Ethyl Butyrate	105-54-5	961.82 lb.	HC & HF
Ethyl Formate	109-94-4	0.34 lb.	HC
Ethyl Isobutyrate	97-61-1	35.26 lb.	HF
Ethyl Lactate	97-64-3	221.72 lb.	HC, HF & HX
Ethyl Methacrylate	97-63-2	2,639.00 lb.	HF
Ethyl Propionate	105-37-3	525.62 lb.	HC & HF
Hexanol	25917-35-5	235.04 lb.	HC & HF
Hexylene Glycol	107-41-5	153.87 lb.	HC & HX
Hydrogen	1333-74-0	3,456.0 cu.ft.	Lab
Iso Amyl Acetate	123-92-2	139.16 lb.	HF
Iso Amyl Alcohol	123-51-3	624.83 lb.	HF
Iso Butyl Acetate	110-19-0	79.44 lb.	HC & HF
Iso Butyl Alcohol	78-83-1	87.00 lb.	HF
Iso Butyraldehyde	78-84-2	24.92 lb.	HF & HX
Iso Propyl Alcohol	67-63-0	29,345.74 lb.	HC & HF
Kerosene	8008-20-6	613.56 lb.	HC

ATTACHMENT E

Material	CAS Number	Quantity	Location
Methyl Acetate	79-20-9	44.00 lb.	HF
Methyl Alcohol	67-56-1	3,267.00 lb.	HC
Methylene Chloride	75-09-2	21,322.78 lb.	HF
N-Amyl Acetate	628-63-7	1,733.65 lb.	HC & HF
N-Butyl Acetate	123-86-4	561.90 lb.	HC & HF
N-Butyl Alcohol	71-36-3	596.63 lb.	HC & HF
N-Hexane	110-54-3	624.00 lb.	HF
Naphthalene	91-20-3	0.64 lb.	HC
Nitrogen	7727-37-9	1,000.0 gal	HC, HF & HX
p-Cresol	106-44-5	1.52 lb.	HX
Phenol	108-95-2	1.07 lb.	HC
Pinene	1330-16-1	2,446.31 lb.	HC & HF
Propionic Acid	79-09-4	338.30 lb.	HC & HF
Saccharin	81-07-2	4.21 lb.	HC
Silver Nitrate	7761-88-8	.05 lb.	Lab
Sodium Hydroxide	1310-73-2	2,450.00 lb.	HF
Styrene Monomer	100-42-5	5.74 lb.	HC
Terpinolene	586-62-9	5,928.87 lb.	HC
Turpentine	9005-90-7	11,400.70 lb.	HC, HF & HX
Valeraldehyde	110-62-3	0.20 lb.	HF
Valeric Acid	109-52-4	73.90 lb.	HF

ATTACHMENT E

Rec'd
4/7/86
DWM - BISE

SOIL SAMPLING RESULTS AND CLEANUP PLAN RECOMMENDATIONS CELL NO. 4 EXCAVATION PPF/NORDA FACILITY EAST HANOVER, NEW JERSEY

ADRON, INC.

APRIL 7, 1986

Dames & Moore
CRANFORD, NEW JERSEY

ATTACHMENT F

Dames & Moore

6 Commerce Drive
Cranford, New Jersey 07016
(201) 272-8300

April 7, 1986

Ms. Dawn Pompeo
Dept. of Environmental Protection
Bureau of Industrial Site Evaluation
Hazardous Site Mitigation
CN-028
428 East State Street
Trenton, New Jersey 08625

Re: Soil Sampling Results and
Cleanup Plan Recommendations
Cell No. 4 Excavation
PPF/Norda Facility
East Hanover, New Jersey
For ADRON, Inc.

Dear Ms. Pompeo:

INTRODUCTION

As discussed during our meeting at the East Hanover facility on March 18, 1986, we are transmitting with this letter the finalized laboratory analytic results of soil samples obtained from Drum Cell No. 4. In this letter we also discuss the cleanup efforts, soil sampling efforts and the analytic results which established concentration gradients for residual compounds in the excavation bottom and sidewalls. As requested, we review site hydrogeology and provide estimated costs for additional soil removal from the excavation. On the basis of this information we then provide our conclusions and recommendations for finalizing Cell No. 4 cleanup.

CLEANUP ACTIVITY - CELL NO. 4 EXCAVATION

Removal Operations

Drum removal activities at the site are complete at Cell No. 4. Removal was conducted using backhoes, a vacuum truck, sump pumps and dump trailers as described in the Site Cleanup Plan. Approximately 1,400 drums, 43,000 gallons of perched water, and 1,000 cubic yards of backfill and contaminated soil have been removed during the excavation of Drum Cell No. 4. Cleanup activities in the drum cell continued until all drums were excavated and natural soils were encountered and all perched water was evacuated from the excavation. The source of contamination, therefore, has been removed.

SOIL SAMPLING AND ANALYSIS

Soil sampling activities in Cell No. 4 involved extracting 12 soil samples from the bottom and sidewalls of Cell No. 4. These were composited and tested for a full priority pollutant scan and "plus 40" library search. Since these results showed

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elevated levels in some compound groups, distinct samples were analyzed to locate contaminant zones. When "hot spots" were located, additional sampling was performed to 3.5 feet into the cell sidewall and bottom to obtain contaminant gradient information. These data were used to guide additional soil removal in the excavation sidewalls at the "hot spots". The details of this operation are presented in Appendix A. Copies of the laboratory reports are enclosed and the results of analysis summarized on Tables 1 through 4 and Figures 1 and 2.

DATA EVALUATION

Soil Concentrations

The data indicate that after removal of the contaminant source -drums, perched water and backfill material - isolated pockets of soils with organic compound concentrations in excess of ECRA alert levels remain in the excavation. The locations of these pockets were identified. Additional sampling at these locations showed that the concentration of identified priority pollutant compounds decreases dramatically from 1/2 foot depth to 3-1/2 foot depth into excavation bottom and sidewalls. The decrease in the concentration is approximately one order of magnitude or greater across the 3-1/2 foot distance. Visual observations made while sampling soils 3-1/2 feet below the excavation bottom show that at this depth, soils appear very dense and hard with low permeabilities. Rain water in the excavation and test pits at bottom sample locations ponded and remained perched until removed with a vacuum truck. These observations confirmed the results of permeability testing which showed that these soils have a low permeability.

Contaminant Characterization - Soil/Ground Water

The majority of the priority pollutant compounds detected in the soils from the excavation were not detected in the ground water. The only priority pollutant compounds identified in both the excavation's soils and in ground water samples obtained from onsite monitor wells are trichloroethylene, diethylphthalate, xylene, Bis(2-ethylhexyl) phthalate, methylene chloride, and toluene. The only priority pollutant organic compounds detected in Monitor Well No. 2, located approximately 200 feet downgradient of the excavation, are trichloroethylene and 1,2-Transdichloroethylene. These compounds were detected at trace levels in the water samples with the exception of trichloroethylene which was detected at 115 parts per billion. Water samples obtained in 1984 from on-site monitoring wells show that total priority pollutant organic contaminant levels range from 11 to 170 ppb in water. Eleven compounds found in the excavation soils including all base/neutral compounds identified above detection levels were not detected in ground water samples:

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Priority Pollutant Organic Compounds Identified in Drum Cell No. 4 but not in Ground Water

Benzene
Ethylbenzene
1,2 Dichlorobenzene
1,3 Dichlrorbenzene
1,2 Diphenylhydrazine
1,4 Dichlorobenzene
Nitrobenzene
1,2,3 Trichlorobenzene
Phenol
Dimethylphthalate
Di-n-butyl phthalate

Priority Pollutant Organic Compounds Identified in Drum Cell No. 4 Soils and in One or More Ground Water Samples: (10) = maximum concentration in parts per billion detected in ground water samples.

Toluene (10)
Diethylphthalate (10)
Trichloroethylene (10-115)*
Xylene (tentatively identified (in library search)
Methylene chloride (10-25)
Bis(2-ethylhexyl)phthalate (10)

*Review of DEP files indicates that trichloroethylene has been detected in many ground water samples collected throughout the East Hanover area.

The total mass of residual priority pollutant volatile organic compounds in the first 3.5 feet of soil beneath the excavation is estimated to be 2½ pounds. The total mass of base/neutral compounds in the first 3½ feet of soil beneath the excavation is estimated to be 87 pounds. This is a small quantity. These quantities appear even less significant when compared with the approximately 1,400 drums, 3,300,000 pounds of backfill and soil and 43,000 gallons of perched water removed from the excavation.

Geohydrology

Previously developed geohydrologic information and ground water quality data has been presented by Dames & Moore in our report "Geohydrologic Investigation and Consultation, Norda, Inc. Manufacturing Facility, East Hanover, New Jersey", December 1984, and soil permeability data presented by Dames & Moore in our report "Drum Area Geotechnical Investigation, Flavors & Fragrance Manufacturing Facility, East Hanover, New Jersey, December 1985". Five monitor wells were drilled to 45 to 72 feet. Soil borings were drilled to 13 to 17 feet and soil samples collected and tested to determine permeabilities. The tests provide evidence of relative impermeability of the upper soils. The site is underlain by relatively impermeable clayey soils which overlie glacial silty sands and gravels. The ground water surface is approximately 42 feet beneath the bottom of the excavation and ground water flows to the southwest (see Figure 3).

During vertical transport and percolation of rainfall, it is likely the adsorption of organic compounds on soil particles, horizontal movement and dispersion, and natural biodegradation will further reduce concentration levels of the compounds. In addition, the anticipated slow rate of infiltration recharging the aquifer in the future, estimated at 0.05 to 0.5 feet per year (assuming no perched water will accumulate in backfilled excavation), and dilution effects due to mixing of percolating

ATTACHMENT F

water with ground water will minimize any possible potential impact of residual compounds. Final landscaping efforts at the excavation site should include crowning the backfill with clayey topsoil to facilitate draining rainfall runoff away from the excavation. The crowning effort should extend from the fence east of the excavation to the pavement west of the excavation.

SOIL REMOVAL

It should be noted that subsequent to gradient sampling and locating "hot spots", approximately 1-1/2 feet of soil has been removed from the sidewalls of the excavation in the areas surrounding Sidewall Samples SW-3 and SW-5. It was these sidewall areas which sampling showed to have the highest concentrations or residual organic compounds. Therefore, existing contamination levels in these areas which were previously as high as 120 parts per million total volatile organics and 817 parts per million total base/neutral compounds has been reduced to approximately 41 parts per million volatiles and an estimated 40 parts per million base/neutrals.

Cost estimates for further soil removal from Cell No. 4 range from $76,000 to remove a one foot cut to $152,000 to remove a 2 foot cut from the sidewalls and bottom of Cell No. 4. These estimated costs do not include costs for post excavation sampling. This represents a very significant expenditure to remove the small amount of residual compounds in the soils. Details of the cost estimate are presented in Appendix B.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions have been reached on the basis of the information presented in this letter:

- The source of contamination - drums, perched water and backfill - have been removed from the excavation.
- Residual concentrations of organic compounds are found in isolated locations of the excavation. The pockets are of limited extent and remaining portions of the excavation are clean.
- Total residual mass of volatile compounds and base/neutral compounds in the first 3.5 feet beneath the excavation are estimated at 2.5 pounds and 87 pounds, respectively. This is a very small fraction of the total quantity of compounds already removed from the excavation.
- In areas which were shown to have the highest levels of contaminants, the levels of residual concentrations in the soil decrease dramatically - by an order of magnitude or more - across the first 3.5 feet beneath and beyond the excavation bottom and sidewall.
- Approximately 1.5 feet of sidewall soils around sample locations SW-3 and SW-5 has been removed subsequent to sampling, thereby reducing levels of residual contamination in the excavation.

- Dense, relatively impervious soils surround the drum cell sides and bottoms.

- The ground water surface is more than 40 feet beneath the excavation bottom.

- It is anticipated that adsorption, dispersion, biodegradation, and dilution will minimize any potential impact of residual compounds.

- Concentration of total priority pollutant compounds in ground water samples obtained in 1986 from on-site monitor wells were in the low part per billion range.

- Only 6 priority pollutant organic compounds found in the excavation bottom and sidewall samples were detected in the ground water. The concentration of these compounds in ground water is 10-115 ppb each or less. The other 11 priority pollutant compounds detected in the soil including all base/neutral compounds identified above detection limits are not detected in the ground water.

- Estimated cost to remove an additional one foot and two feet of sidewall and bottom soils from the excavation are $76,000 and $152,000, respectively. This represents a significant expenditure in light of removal efforts already extended to remove the vast majority of contaminant source in Drum Cell No. 4. Incremental expenditures on remaining cells and drum removal areas would greatly increase site cleanup costs and not produce proportionate environmental benefits.

In light of these conclusions, we believe that the removal in Drum Cell No. 4 excavation is satisfactory. We recommend that the excavation be backfilled with compacted, clean borrow material and crowned with clayey topsoil.

Should there be any questions or comments concerning this letter, please contact the undersigned.

Very truly yours,

DAMES & MOORE

Anthony Kaufman
Project Manager

AOK/ke
Attach.

ATTACHMENT F

TABLE 1

SUMMARY OF ANALYSIS

CELL NO. 4 — SOIL COMPOSITES

ADRON, INC., EAST HANOVER, NEW JERSEY

	Sidewall	Bottom	Bottom QA/QC
PRIORITY POLLUTANT VOLATILES			
Benzene	2.0	2.0	5.0
Chlorobenzene	0.1		
Ethyl Benzene	7.0	0.5	0.3
Toluene	3.0	2.0	1.0
Dichlorobenzenes	0.6	56.0	39.0
Total Xylenes	38.0	2.0	1.0
Fluorotrichloromethane	0.2		
Methylene Chloride	0.2	0.3	
ACID EXTRACTABLES			
Phenol		9.0	12.0
BASE/NEUTRAL EXTRACTABLES			
1,2-Dichlorobenzene		12.0	0.6 BMDL
1,4-Dichlorobenzene		1.0	
Dimethyl phthalate		4.0	4.0
Diethyl phthalate		2.0	3.0
1,2-Diphenyl hydrazine	21.0	110.0	110.0
Nitro Benzene	44.0	140.0	49.0
METALS AND PHYSICAL CHEMISTRY			
Pesticides and PCB			
Cyanide	< 0.1	< 0.1	0.22
Phenols (total)	0.59	15.2	6.7
Cadmium	< 2.0	< 2.0	< 2.0
Lead	7.3	6.7	10.4
Arsenic	10.0	8.3	8.7
Copper	35.0	35.0	31.0
Mercury	0.08	0.11	0.05
Selenium	< 1.0	< 1.0	< 1.0
Antimony	< 1.0	< 1.0	< 1.0
Beryllium	< 2.0	< 2.0	< 2.0
Chromium (total)	< 2.0	< 2.0	< 2.0
Nickel	36.0	35.0	24.0
Silver	< 2.0	< 2.0	< 2.0
Thallium	< 20.0	< 20.0	< 20.0
Zinc	118.0	83.0	118.0

Notes:

1. Concentrations are in mg/kg (ppm). Blank space indicates compound not found in that sample.
2. Samples obtained from 4-6 inch depth into sidewalls or base of excavation.
3. See attached figure, Drum Cell No. 4 Excavation, for sample locations.
4. BMDL = Compound detected below method detection limit.

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TABLE 2

SUMMARY OF ANALYSIS

CELL NO. 4

ADRON, INC., EAST HANOVER, NEW JERSEY

	Sidewall 1	Sidewall 2	Sidewall 3	Sidewall 4	Sidewall 5	Sidewall 6	Bottom 1	Bottom 2	Bottom 3	Bottom 4	Bottom 5	Bottom 6
VOLATILE ORGANIC COMPOUNDS												
Benzene			0.5		0.5			2.0		0.3		
Ethylbenzene			3.0		20.0					2.4		
Toluene			2.0		5.0			2.1		1.6	.2	
Total Xylenes			17.0		95.0	0.2		0.5		8.2	0.1	
Fluorotrichloromethane					9.0B		8.0B			3.3B		
Methylene Chloride							0.8B					
TOTAL VOLATILES			22.5		120.6	0.2		4.6		12.5	0.3	
BASE/NEUTRAL COMPOUNDS												
1,2-Dichlorobenzene			7.0					84.0		36.0	5.0	BMDL
1,4-Dichlorobenzene								21.0		6.0		
1,2-Diphenyl hydrazone			156.0					7.0				260.0
Nitro benzene			660.0			1.3		32.0		310.0		420.0
1,2,3-Trichlorobenzene								2.0				
Di-n-butyl phthalate		0.1B						3.0B				
TOTAL BASE/NEUTRALS			817.0			1.3		146.0		352.0	<5.0	680.0
TOTAL PHENOLICS							2.4	.36	2.2	3.1	180.0	<.01

NOTES:

1. Concentrations are in mg/kg (ppm). Blank space indicates compound not detected in that sample. The letter B denotes that compound also found in blank. Compounds found in the blank are not included in total.
2. All data are as reported by Century Laboratories.
3. Sidewall samples not analyzed for Total Phenolics.
4. Samples obtained from 4-6 inch depth into sidewalls or base of excavation.
5. See attached figure, Drum Cell No. 4 Excavation, for sample locations.
6. See Tables 3 and 4 for results of analysis of Sidewall 5, Bottom 2 and Bottom 4 samples obtained at greater depths.

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TABLE 3

SUMMARY OF ANALYSIS

CONCENTRATION GRADIENT

SIDEWALL SOIL SAMPLE LOCATION SW-5

CELL NO. 4

ADRON, INC., EAST HANOVER, NEW JERSEY

	SW-5 4"-6"	SW-5-1 1'4"-1'6"	SW-5-2 2'4"-2'6"	SW-5-3 3'4"-3'6"
VOLATILE ORGANIC COMPOUNDS				
Benzene	0.5	0.1	0.3	
Ethyl Benzene	20.0	6.0	0.8	
Toluene	5.0	1.2	0.5	
Total Xylenes	95.0	34.0	4.2	4.5
Trichloroethylene			0.4	
Fluorotrichloromethane	9.0B	0.7B	16.1B	11.4B
Methylene Chloride	____	____	0.2B	____
TOTAL VOLATILES	120.5	41.3	6.2	4.5
% total volatiles as compared with 4'-6" sample depth	100%	34.3%	5.1%	3.7%

NOTES:

1. Concentrations are in mg/kg (ppm). Blank spaces indicate compound not detected in that sample. The letter B indicates that compound also detected in blanks. Compounds found in the blank have not been included in total or percent total figures.

2. All data are as reported by Century Labortories.

3. See attached figure, Drum Cell No. 4 Excavation, for sample locations.

4. See Table 2 for results of sample analysis for all sidewall and all bottom samples from 4-6 inch depth.

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TABLE 4

SUMMARY OF ANALYSIS

CONCENTRATION GRADIENT

CELL NO. 4

BOTTOM SAMPLE LOCATIONS B-2 AND B-4

ADRON, INC., EAST HANOVER, NEW JERSEY

	Sample Designation and Depth				Sample Designation and Depth			
	B-2 4"-6"	B-2-1 1'4"-1'6"	B-2-2 2'4"-2'6"	B-2-3 3'4"-3'6"	B-4 4"-6"	B-4-1 1'4"-1'6"	B-4-2 2'4"-2'6"	B-4-3 3'4"-3'6"
VOLATILE ORGANIC COMPOUNDS								
Benzene	2.0		1.0 BMDL		0.3	0.5 BMDL		0.3
Ethyl Benzene					2.4			0.3
Toluene	2.1	1.2	1.0 BMDL		1.6	1.4		2.6
Total Xylenes	0.5	1.0			8.2	1.0 BMDL	0.2	0.8
Fluorotrichloromethane		22.9B	39.1B	23.9B	3.3B	13.6B	1.5B	7.5B
Methylene Chloride			1.0 BMDL	.5 BMDL		.5 BMDL		
TOTAL VOLATILES	4.6	2.2	<3.0	<.5	12.5	2.9	0.2	4.0
% Total Volatiles as compared with 4-6" sample depth	100%	47%	<65%	<10%	100%	23.2%	1.6%	32%
BASE/NEUTRAL COMPOUNDS								
1,2-Dichlorobenzene	84.0		.3	0.2	36.0			
1,3-Dichlorobenzene		0.2						
1,4-Dichlorobenzene	21.0				6.0			
1,2-Diphenylhydrazine	7.0						14	24
Nitrobenzene	32.0				310	21.0	6	6
1,2,3-Trichlorobenzene	2.0							
Diethyl phthalate		0.2 BMDL						
Di-n-butyl phthalate	3.0B							
Bis-2-ethyl hexyl phthalate		0.2 BMDL						
TOTAL BASE/NEUTRALS	146	<.6	.3	.2	352	21.0	20	30
% Total Base/Neutrals compared with 4-6" sample depth	100%	<.4%	0.2%	0.1%	100%	5.9%	5.7%	8.5%

NOTES:

1. Concentrations are in mg/kg (ppm). Blank spaces indicate compound not detected in that sample. The letter B indicates that compound also found in blank. Compounds found in the blank are not included in the total or percent total figures.
2. All data are as reported by Century Laboratories.
3. See attached figure, Drum Cell No. 4 Excavation, for sample locations.
4. See Table 2 for results of sample analysis for all sidewall and all bottom samples from 4-6 inch depth.
5. BMDL = Compound detected but below method detection limit.

ATTACHMENT F

Dames & Moore
6 Commerce Drive
Cranford, New Jersey 07016
(201) 272-8300

March 4, 1986

Ms. Dawn Pompeo
Dept. of Environmental Protection
Bureau of Industrial Site Evaluation
Hazardous Site Mitigation
CN-028
428 East State Street
Trenton, New Jersey 08625

Re: Data Submittal
ECRA Sampling Plan
ECRA Case No. 84294
PPF/Norda
East Hanover, New Jersey
For ADRON, Inc.

Dear Ms. Pompeo:

In accordance with Dames & Moore's ECRA Sampling Plan dated August 14, 1985, New Jersey Department of Environmental Protection (NJDEP) letter approval of the Sampling Plan dated December 5, 1985 and the Administrative Consent Order between Norda and NJDEP, we are submitting the results of analysis of samples obtained during implementation of the sampling plan at the PPF/Norda facility. The following areas identified in the Sampling Plan have been or are currently being investigated and sampled:

Area Designation	Description
S-1	Three sumps used to collect and contain process wash water
S-2	Seven septic systems
S-3	Fire pond area south of Buildings D and B-1
S-4	Drum cleaning area located north of Building No. 22
S-5	Fill area between Murray Road and the plant's northern fence line
S-6	Disposal area along eastern fence line in which drums containing process materials were buried
S-7	Building No. 1 and Platform No. 7 whic' were damaged by historical fires
S-8	Catch basins

3

ATTACHMENT

S-9	Dumpster
S-10	Catch basin at Vehicle Maintenance Building
S-11	Fuel oil tanks
A	Background soil quality area located near plant entrance from Route 10
B	Ground water quality on-site

The results of samples from Area S-7 and Area B were presented to NJDEP in December 1984 in a report prepared by Dames & Moore entitled "Geohydrologic Investigation and Consultation, Norda, Inc. Manufacturing Facility, East Hanover, New Jersey". The remaining areas are currently being investigated. Areas S-1, S-2 and S-3 were investigated by drilling eight borings and selecting samples from each for analysis. Logs of the borings showing the soils encountered, results of sample screening with a Foxboro Organic Vapor Analyzer Model 128 and the samples selected for analysis are presented on Figures 2, 3 and 4. Sediment and soil samples were collected from Areas S-4, S-8, S-9, S-10 and Area A, using disposable trowels or hand auger. A water sample from a stream in Area S-5 has been collected and test pits will be excavated from which an additional soil sample will be collected. Sample analysis is being performed by Environmental Testing and Certification (ETC) of Edison, New Jersey. Sampling locations are presented on Figure 1.

Drum removal efforts are ongoing in Area S-6 and soil samples will be collected from drum cell excavations are required by the Sampling Plan. Prior to implementing drum removal efforts, two test pits were excavated in the drum disposal area and 12 soil samples were collected. Samples were collected at various depths and varying distances from the edge of drum cells and delivered to Century Laboratories of Thorofare, New Jersey for analysis of priority pollutant volatile organic compounds. The locations of these samples are shown on Figures 5, 6 and 7 and the results of analysis are summarized on Table 3.

As indicated in his letter of February 26, 1986, Mr. David Reger of Stryker Tams & Dill advised the Bureau that the results of all laboratory data are not currently available. Specifically, chemical data from a soil sample in Area S-5, data from priority pollutant metals analysis from the water sample in Area S-5, and finalized data from a soil sample in Area A have not yet been received from the laboratory. The schedule for investigation in Area S-5 was revised to allow for review of geophysical data secured for this area. ETC did not filter the water sample for metals analysis which was obtained in Area S-5 and subsequently this sample needed to be recollected and analyzed. Preliminary laboratory results for the sample from Area A have been presented. As additional data and finalized laboratory results become available, they will be forwarded to you.

The results of laboratory analysis for samples obtained during this investigation are presented in Tables 1 and 2. Table 1 identifies the sample designation,

laboratory performing analysis, sample description and sample location. Table 2 summarizes the results of analysis for which data are currently available.

In addition to the tabulated data included with this letter, we have enclosed complete copies of all laboratory reports for submittal to NJDEP. The reports contain quality assurance and quality control information which cannot be presented on the tables.

With respect to the chemical information obtained from the sampling, all but one soil sample analyzed by ETC contained priority pollutant volatile organic contamination levels below ECRA cleanup levels of 1 ppm. The sediment sample from the northern catch basin contained total petroleum hydrocarbon levels of 370 ppm. It was planned to analyze the sediment sample from the vehicle maintenance building's catch basin for volatile organic compounds with plus 15 search and total petroleum hydrocarbons. However, the catch basin barely contained enough sediment to allow for volatile compound analysis and, therefore, the petroleum hydrocarbon testing could not be performed.

Low levels of methylene chloride were detected in several samples analyzed by ETC. Tetrachloroethene was also detected in the plus 40 scan for the water sample from Area S-5. We discussed this with the laboratory and were informed that methylene chloride at the levels which were detected in the samples, may be attributable to concentrations of this solvent in the ambient air at the laboratory. The tetrachloroethene is attributable as a compound also introduced at the laboratory as part of the extraction process. We have attached to this letter, a letter from ETC which states this information.

Three of the 12 soil samples obtained from test pits excavated at the drum cell deposits contained priority pollutant volatile organic compound concentration levels which appeared to exceed ECRA cleanup levels. However, the compound of potential concern, fluorotrichloromethane, was also detected in the trip blank and method blank, indicating that the source of this compound is not the sample media but is likely to be an outside source. Soil samples obtained from these test pits excavated in the immediate vicinity of and immediately adjacent to drum cells Nos. 1 and 4 are free of priority pollutant volatile organic contaminants.

We are presently preparing a report which thoroughly addresses the site conditions and if necessary, will present any additional cleanup plans which may be required.

The following tables, figures and attachments are included with this letter:

Table 1	Sample Summary
Table 2	Summary of Analysis - ECRA Sampling
Table 3	Summary of Analysis, Test Pit Samples at Drum Cells Nos. 1 and 4

ATTACHMENT G

Figure 1	Plot Plan
Figures 2 through 4	Logs of Borings
Figure 5	Test Pit Locations
Figure 6	Test Pit, Cell No. 1
Figure 7	Test Pit Cell No. 4
Attachment	Letter from Mr. Ken Baker, ETC

If there are any questions or comments, please contact the undersigned.

Very truly yours,

DAMES & MOORE

Anthony O. Kaufman
Project Manager

AOK:jp

Attachments

Tables 1 through 3
Figures 1 through 7
Letter from Mr. Ken Baker, ETC

cc: Mr. Louis Amaducci, ADRON
Mr. Robert Amaducci, ADRON
Mr. William Amaducci, ADRON
Mr. David Reger, Stryker Tams & Dill

ATTACHMENT G

TABLE 1

ECRA SAMPLING PLAN

SAMPLE SUMMARY[1]

ADRON, INC.

EAST HANOVER, NEW JERSEY

Sample Point Designation	Performing Analysis[2]	Sample Description	Sample Location[3]
Field Blank	ETC	Water Sample for Quality Assurance	Collected at Boring 108
SB 101S3	ETC	Soil Sample at Sump Bldg 25	Boring 101, 12-13 ft. below grade
SB 102S3	ETC	Soil Sample at Sump Bldg 22	Boring 102, 9½-10 ft. below grade
SB 103S4	ETC	Soil Sample at Septic Tank Bldg 3	Boring 103, 6-8 ft. below grade
SB 104S4	ETC	Soil Sample at Sump Bldg 27	Boring 104, 9-9½ ft. below grade
B104	ETC	Soil Sample for Septic Bldgs 23, 25 and 27	Boring 104, 18-20 ft. below grade
S-22	ETC	Soil Sample for Septic Bldgs D and B-1 and Vehicle Maintenance Bldg.	Boring 105, 42-44 ft. below grade
B106S9	ETC	Soil Sample for Septic Bldg #1	Boring 106, 16-18 ft. below grade
B 107-S19	ETC	Soil Sample for Septic Bldgs D and B-1	Boring 107, 36-38 ft. below grade
B 108-S5	ETC	Soil Sample from Fire Pond	Boring 108, 9-10 ft. below grade
DRC1	ETC	Soil Sample from Drum Cleaning Area	Drum Cleaning Area northeast of Bldg 22, 2 ft. below grade
SDUM	ETC	Soil Sample Below Southern End of Dumpster	Dumpster northwest of Bldg 22
NDUM	ETC	Soil Sample Below Northern End of the Dumpster	Dumpster northwest of Bldg 22
SCB	ETC	Soil/Sediment Sample from Catch Basin	Catch basin north of vehicle Vehicle Maintenance Bldg along western plant boundary
VM	ETC	Soil/Sediment Sample from Catch Basin at Vehicle Maintenance Bldg	Catch basin at southern end of Vehicle Maintenance Bldg.
NCB	ETC	Soil/Sediment Sample from Catch Basin	Catch basin north of fence corner at northwest corner of plant
SLAWN	ETC	Soil Sample	Grassy area near southern entrance to plant.
RSTRM	ETC	Water Sample from Stream/Seep	Seep entering wooded area northwest of MW-5.

ATTACHMENT G1

TABLE 1 (continued)

Sample Point Designation	Performing Analysis[2]	Sample Description	Sample Location[3]
Method Blank	CL	Method Blank	—
Trip Blank	CL	Trip Blank	—
Sample #2	CL	Soil Sample	Trench at Cell #4, 3 ft. below grade, 1/2 ft. from drum deposit
Sample #4	CL	Soil Sample	Trench at Cell #4, 3 ft. below grade, 6½ ft. from drum deposit
Sample #5	CL	Soil Sample	Trench at Cell #4, 3 ft. below grade at side of cell deposit
Sample #8	CL	Soil Sample	Trench at Cell #4, 3 ft. below grade, 1½ ft. from drum deposit
Sample #9	CL	Soil Sample	Trench at Cell #4, 8 ft. below grade, 2 ft. from drum deposit
Sample #11	CL	Soil Sample	Trench at Cell #4, 5 ft. below grade, 2½ ft. from drum deposit
Sample #13	CL	Soil Sample	Trench at Cell #1, 8 ft. below grade, 2½ ft. from drum deposit
Sample #14	CL	Soil Sample	Trench at Cell #1, 8 ft. below grade, 10½ ft. from drum deposit
Sample #16	CL	Soil Sample	Trench at Cell #1, 5 ft. below grade, 1/2 ft. from drum deposit
Sample #18	CL	Soil Sample	Trench at Cell #1, 8 ft. below grade, 15 ft. from drum deposit
Sample #21	CL	Soil Sample	Trench at Cell #1, 3 ft. below grade, 12½ ft. from drum deposit
Sample #22	CL	Soil Sample	Trench at Cell #1, 7½ ft. below grade, 1/2 ft. from drum deposit
Borrow Pit	CL	Soil Composite from 4 locations	Borrow Pit/Sand and Gravel Quarry

NOTES:

1. Summary of samples for which laboratory data has been received by 2/28/86.
2. ETC= Environmental Testing & Certification, Edison, New Jersey
   CL= Century Laboratories, Inc., Thorofare, New Jersey
3. Refer to Figure 1 for location of samples analyzed by ETC and to Figures 5, 6 and 7 for location of samples analyzed by CL.
4. See Tables 2 and 3 for results of chemical analysis.

ATTACHMENT G

TABLE 2

SUMMARY OF ANALYSIS

ECRA SAMPLING

ADRON, EAST HANOVER, NEW JERSEY

		AREA DESIGNATION								
		Area S-1	Area S-1	Area S-2	Areas S-1, S-2	Area S-2	Area S-2	Area S-2	Area S-2	Area S-3
		SAMPLING POINT								
	Field Blank	SB101S3	SB102S3	SB103S4	SB104S4	B104S9	S-22	B106S9	B107-S19	B108-S
Priority Pollutant Volatile Compounds										
Benzene										134
Ethylbenzene										229
Methylene Chloride	21.6		18.0	143		159	162	193	BMDL	171
Toluene					62.5				BMDL	3,110
Tentatively Identified Volatile Compounds										
Unknown	•(1)									
Unknown		•(1)								
Unknown				•(1)						
Unknown					•					
Cyclohexene, 1-methyl-4-(1-methylethenyl)					•					
Carbon dioxide						•(1)	•(1)	•(1)	•(1)	
Unknown						•			•	
Unknown						•				
Unknown						•				
Unknown						•				
Alkane						•				
2-Propanone										•
Unknown										•
Unknown										•
1,3,3-trimethyl-2-oxabicyclo (2.2.2.) octane										•
1,3,3-trimethyl-bicyclo (2.2.1) heptan-2-one										•
1,7,7-trimethyl-bicyclo (2.2.1) heptan-2-one										•
3,3,5-trimethylcyclo hexanone										•
Unknown										•
Unknown										•

NOTES:

Concentrations are in parts per billion (ppb).

See last page of Table 2 for complete notes.

ATTACHMENT G

TABLE 2 (continued)

	AREA DESIGNATION							
	Area S-4	Area S-9	Area S-9	Area S-8	Area S-8	Area S-10	Area A	Area S-5
	SAMPLING POINT							
	DRCL	SDUM	NDUM	SCB	NCB	VM	SLAWN	RSTRM
Priority Pollutant Volatile Compounds								
Methylene Chloride	107	79.9	166	181	148	481	77.7	BMDL
Toluene				BMDL		33.4		
Petroleum Hydrocarbons					370 (ppm)			
Tentatively Identified Volatile Compounds								
Carbon Dioxide		*(1)	*(1)	*(1)	*(1)	*(1)	*(1)	
Unknown				*				
Methyl Methyl ethyl cyclohexane		*			*			
Tentatively Identified Acid Compounds								
Hexane								
3 Methyl Pentane							*(1)	
Unknown							*	
Methylcyclo Pentane							*(1)	
Unknown							*	
Cyclohexane							*(1)	
3-Methyl hexane							*	
Tetrachloroethene							*(1)	*(1)
Unknown							*	
Unknown								*(1)
Alkane								*(1)
Alkane								*(1)
Methyl Phenol								*
Unknown								*
Unknown								*
Unknown								*
Unknown								*
Benzene acetic acid								*
Benzene propanoic acid								*
Unknown								*
Unknown								*

NOTES:

Concentrations are in parts per billion (ppb).

See last page of Table 2 for complete notes.

ATTACHMENT G

TABLE 2 (continued)

	AREA DESIGNATION							
	Area S-4	Area S-9	Area S-9	Area S-8	Area S-8	Area S-10	Area A	Area S-5
	SAMPLING POINT							
	DRCL	SDUM	NDUM	SCB	NCB	VM	SLAWN	RSTRM
Tentatively Identified Base/Neutral Compounds								
4-methyl 2-pentanone								•
Unknown								•
Tetrachloroethene								•
Unknown								•
Unknown								•
Alkane								•
Unknown								•
Alkene								•
Unknown								•
Phenolics, Total								< 50 ug/ml
Cyanide, Total								< 25 ug/ml
Metals, Cyanide and Phenols								
Antimony								
Arsenic								4,000
Beryllium								500
Cadmium								700
Chromium								25,000
Copper								15,000
Lead								15,000
Mercury								
Nickel								17,000
Selenium								
Silver								
Thallium								BMDL
Zinc								48,000
Cyanide, Total								< 500
Phenolics, Total								< 100

NOTES:

1. Table 2 presents currently available data. Additional data for sample RSTRM and SLAWN and from Area S-5 are forthcoming.
2. Concentrations are in ug/kg (parts per billion) unless otherwise noted. Blank spaces indicate the compound was not detected in that sample.
3. Sample NCB analyzed for Priority Pollutant Volatile Organic Compounds with +15 search and Total Petroleum Hydrocarbons; samples SLAWN and RSTRM analyzed for full Priority Pollutant compounds with +40 search; all other samples analyzed for Priority Pollutant Volatile Organic Compounds with +15 search.
4. Data from sample SLAWN are preliminary.
5. * denotes compound identified in +15 or +40 search.
6. $*^{(1)}$ denotes compound also identified in blank.
7. BMDL = Below Method Detection Limit.
8. See Table 1 for sample description. See Figure 1 and boring logs for sample location.

ATTACHMENT G

TABLE 3

SUMMARY OF ANALYSIS

TEST PIT SAMPLES AT DRUM CELLS NOS. 1 AND 4

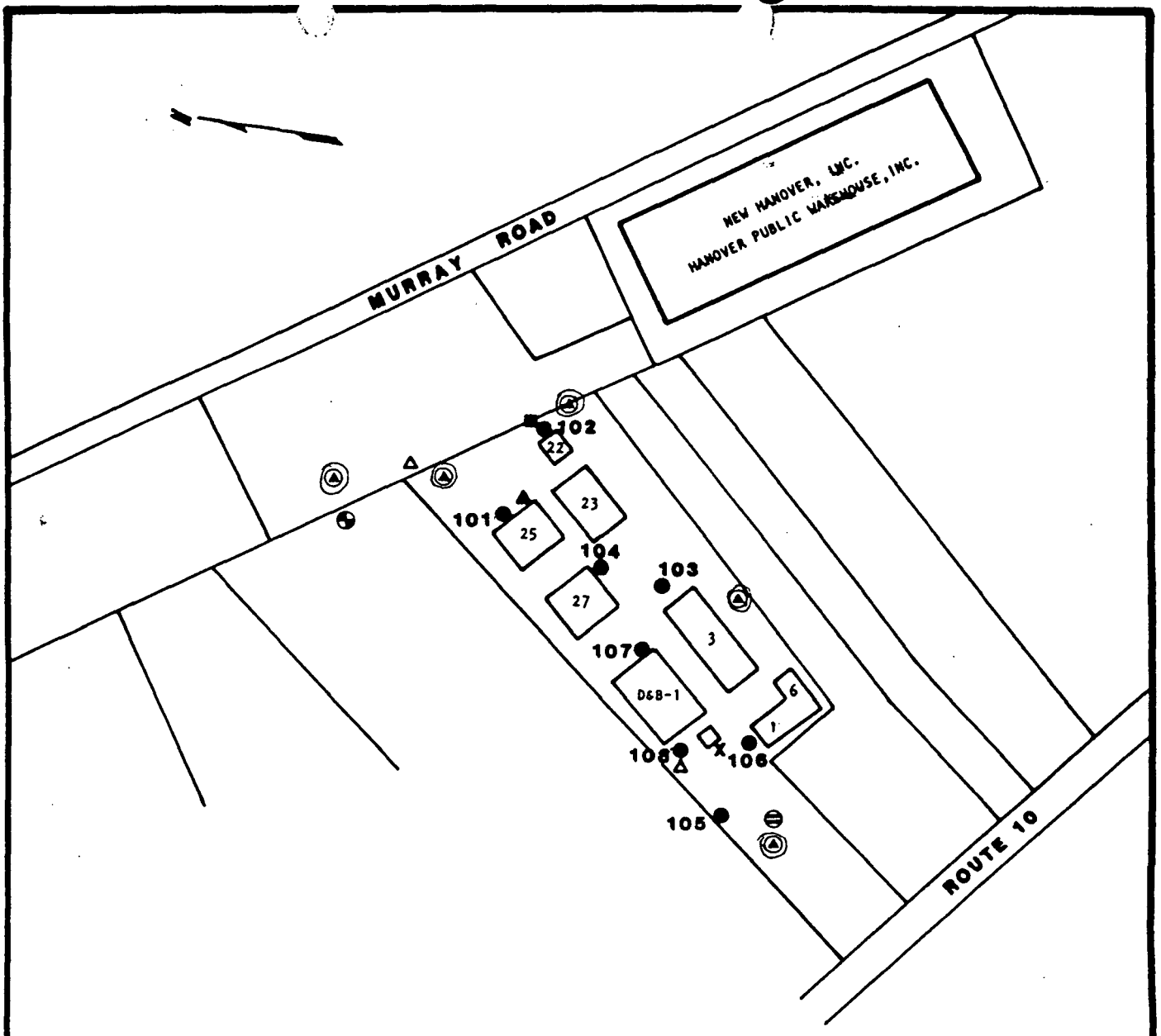
AND BORROW PIT

	SAMPLE NUMBER												
	2	4	5	8	9	11	13	14	16	18	21	22	Borrow Pit
Fluorotrichloro methane				.6	1.0	3.4	3.1			.6			

NOTES:

1. Concentrations are in mg/kg (parts per million).
2. Samples analyzed for Priority Pollutant Volatile Organic Compounds. Only those compounds detected are noted. Blank spaces indicate compound not detected in that sample.
3. Fluorotrichloromethane was detected in trip blank and method blank, indicating an outside source of this compound.
4. See Table 1 for sample description. See Figures 5, 6 and 7 for sample location.
5. No Priority Pollutant organic compounds detected in borrow pit soil sample composite.

ATTACHMENT G



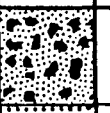
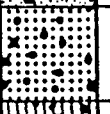
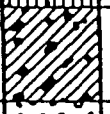
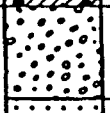
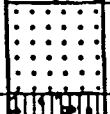
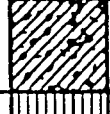
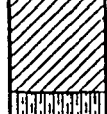
PLOT PLAN
APPROXIMATE SAMPLING POINT LOCATIONS
ECRA SAMPLING PLAN
ADRON - EAST HANOVER, N.J.

K E Y:

- ⊛ MONITORING WELL INSTALLED PREVIOUSLY BY DAMES & MOORE
- 105 ● BORING & SOIL SAMPLING LOCATION AT SUMPS AND SEPTICS
- x SEDIMENT SAMPLE AT VEHICLE MAINTENANCE BUILDING
- △ SEDIMENT SAMPLES AT CATCH BASINS
- ■ SOIL SAMPLE AT DRUM CLEANING AREA
- ▲ SOIL SAMPLES AT DUMPSTER
- ◔ WATER SAMPLE FROM STREAM/SEEP
- ⊖ SOIL SAMPLE AT SOUTHERN PLANT ENTRANCE

ATTACHMENT G

DAMES & MOORE

MAJOR DIVISIONS			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS — MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS — MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

DAMES & MOORE

ATTACHMENT G

GEOHYDROLOGIC INVESTIGATION AND CONSULTATION
NORDA, INC. MANUFACTURING FACILITY
EAST HANOVER, NEW JERSEY

PREPARED FOR STRYKER TAMS & DILL

NOVEMBER 7, 1984
JOB NO. 12295-004-10

Dames & Moore

CRANFORD, NEW JERSEY

ATTACHMENT 1

TABLE OF CONTENTS

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James & Moore

ATTACHMENT 14

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ATTACHMENT H

1.0 INTRODUCTION

Norda, Inc. is currently negotiating the sale of their flavors and fragrances manufacturing plant located in East Hanover, New Jersey. As part of the divestiture proceedings, Norda contracted with Dames & Moore to perform a geohydrologic study and provide consultation and technical assistance to Norda and their legal counsel to comply with the New Jersey Environmental Cleanup Responsibility Act (ECRA).

In addition to determining the overall hydrogeologic regime of the study area, a primary effort of Dames & Moore's on-site geohydrological study concentrated on areas suspected to contain process wastes from the plant operations. These suspect areas include the locations of: two fire damaged buildings; a fill area at the property's northern boundary containing construction rubble and occasional drums; a former drum disposal area comprising an area approximately 30 x 500 feet into which several pockets or cells of drums were deposited about 20 years ago. The drums are reported to contain primarily process wastes and possibly other material.

The purposes of Dames & Moore's investigation were as follows:

1. Investigate stratigraphy and geohydrologic conditions on the site, including ground water quality.

2. Evaluate the extent and conditions of buried drums.

3. Evaluate soil conditions in the drum disposal area.

4. Investigate the thickness and physical/chemical characteristics of fill placed on the northern boundary of the site.

5. Establish ground water quality in the fill area.

6. Evaluate the soil chemistry in the fill area and in the sites of two burned buildings.

The scope of work involved in this ongoing project included; 1) a review of existing hydrogeological data pertinent to the study site area; 2) a magnetometer

D-4

Dames & Moore

ATTACHMENT 1

survey of the drum disposal areas to locate drum deposits; 3) excavating and logging exploratory test pits to evaluate soil conditions, to verify the magnetic survey interpretations, and to expose drums for visual inspection; 4) drilling five exploratory borings and installing ground water observation wells in each; 5) sampling and analysis of ground water, soil, and waste matrix samples.

Based on an analysis of data from site explorations, estimates of the quantity of material and number of drums for removal were developed. Preliminary cost estimates for the removal project were then developed considering site specific project plans and unit costs provided by three experienced remedial action contractors.

2.0 SITE BACKGROUND

The Norda plant site, located at 140 N.J. Route 10, occupies approximately 11 acres in East Hanover, Morris County, New Jersey (Figure 1). The property boundaries roughly define a rectangle whose long axis runs approximately North-South. The site is situated between Route 10 and Murray Road in a commercial section of East Hanover. The site is bounded on the east by a drum recycling company, on the west by the Ramada Inn Motel and a golf driving range, on the north by Murray Road and a warehouse complex, and on the south by Route 10.

The facility is an active flavors and fragrance manufacturing plant which supplies raw materials and other ingredients to its customers in this industry. Existing structures on-site include several buildings which consist of storage, maintenance, administrative, laboratory and processing facilities. In addition, both above ground and below ground tanks existing on-site hold petroleum products and process materials. Petrotite leak tests are being performed on all underground tanks by Fairfield Maintenance Company. The majority of the plant site is paved with asphalt or covered by buildings. Unpaved, grass-covered areas are found along the eastern fence line, along the west side of the entrance drive from Route 10, along both sides of the northern fence line, extending to Murray Road. A small off-site retention pond used to collect rainwater from adjacent property to the west is located near the northwest fence corner. Non-contact cooling water is discharged through a weir to a small brook which runs northwest of the plant's property. Norda has a NJPDES permit for this discharge.

Process activities at the plant consist of resale and repackaging; blending of flavor and fragrance ingredients including essential oils, and extracting and distilling natural fragrances and flavor materials. In addition, flavors and fragrances research and development are conducted on-site.

Two historical fires damaged buildings at the site. In 1947, a fire destroyed a building which held cosmetics, spices and essential oils. This building was situated east of existing building No. 3 and the concrete pad on which it was built still remains. In 1960, a fire damaged the second floor laboratory of existing building No. 1. Essential oils, starting materials and finished fragrance compounds were stored in the building. Water used to fight the fire was collected in a "fire pond" located at the southwest corner of the administration building. Subsequently, this area was backfilled and paved over.

In the early 1960's, construction rubble and scattered drums reported to contain hard residues and still bottoms from process activities were backfilled in the area lying between Murray Road, the northern fence boundary. Additional backfilling of this area utilized natural, surficial clays removed during construction on adjacent properties.

At about the same time, drums, reported to contain process waste and aromatic still bottoms were buried in the area between the eastern parking lot and eastern fence boundary. Additional drums were buried in an area east of this fence line. The drums were deposited in the clay layer which constitutes the surficial soils found at the site. On site clayey soils were used as backfill during drum burial.

3.0 REGIONAL SETTING

3.1 GEOLOGIC CONDITIONS

The eastern one-third of Morris County, in which East Hanover is located, lies in the Piedmont Physiographic Province. Climate of this province is classified as continental.

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The Norda site overlies the Triassic Brunswick Formation, a geologic unit consisting of shales and sandstones, the uppermost member of the Newark Group. Glacially derived tills, sands, gravels and clays overlie bedrock.

The province is characterized as a region of low-lying plains and gently sloping hills with occasional basalt ridges. Altitudes are on the order of 200 to 400 feet above mean sea level. Present day physical features and topography are primarily the result of Pleistocene glacial episodes with the most recent episode, Wisconsin Glaciation, having created the features which are currently most visible.

A terminal moraine extending northwest through Morris County is the largest glacial feature in the area. The moraine marks the southernmost extent of the Wisconsin glacial advance. Norda is bounded to the south and west by the moraine which passes through the towns of Chatham, Livingston and Morristown (Figure 2). During the Pleistocene Glaciation, channels cut in the existing surface by the Passaic River drainage system served as conduits through which limbs of the glacier passed. As a result of the glacial advance, these ancient river channels were filled with coarse sands and gravels that today serve as primary aquifers in the area. Figures 3 and 4 depict the location of these buried valley aquifers and a north-south geologic cross section through the southern part of the East Hanover valley.

As the glaciers retreated, meltwater from the ice mass was trapped by the relatively impermeable moraine. Water which collected formed Glacial Lake Passaic whose existence is marked by fine clays and silts that mantle the area today. This geologic history resulted in the subsurface conditions seen in the area today: extensive clays and silts of low permeability overlying permeable alluvial deposits in glacial valleys overlying bedrock.

3.2 REGIONAL WATER RESOURCES

3.2.1 Regional Water Production Wells

Wells which draw water from the coarse valley fill deposits in the East Hanover area are reported to have prolific yields. Additional wells which are screened in the underlying shale bedrock are able to draw substantial volumes of water from fractures in the shale. Several wells within approximately one-half mile of the Norda

facility have reported yields of between 50 and 650 gallons per minute. Locations of these nearby production wells are shown in Figure 5. Well specifications are listed in Table 1.

3.2.2 Regional Water Quality

Both municipal and private water wells in East Hanover have been tested by authorities for the presence of volatile organic contamination. Ground water at several areas of the township appears to be contaminated with trichloroethylene (TCE) and trichloroethane (TCA). Other contaminants, including chloroform, trans 1,2-dichloroethylene, 1,1-dichloroethylene, benzene, methylene chloride, toluene, ethyl benzene, and tetrachloroethylene have also been found. TCE and TCA however, are the primary compounds of concern because they have been found more often than the other compounds and in concentrations as high as 1,700 parts per billion (ppb). A summary of ground water quality of private and municipal wells near Norda is presented in Table 2.

4.0 FIELD PROGRAM

A detailed magnetometer survey was conducted in the northern fill area and in the drum burial area. The data obtained from the survey was used to design a program of exploratory test pits necessary to augment and better define the interpretations of the survey with respect to the buried drums. A soils/waste/perched water sampling and analytical plan was then instituted using two independent, certified laboratories for quality control and quality assurance. The analytical program conformed to ECRA guidelines. Site specific hydrogeology was determined through drilling five exploratory borings along the plant's perimeter and installing ground water monitoring wells in each. Ground water samples were extracted for determination of ground water quality. These are described below.

4.1 MAGNETOMETER SURVEY

A magnetic survey of the drum burial and landfill areas was performed on October 18, 1984, using a Scintrex MP-2 proton magnetometer. The theory of this type of survey is that where buried masses of iron are present, magnetic intensity is influenced. Locations of the survey areas are shown on Figure 1, Site Plan.

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Measurements of total flux intensity of the earth's magnetic field were made in grid patterns in these areas. The north-south (X) and east-west (Y) lines of the grid pattern run parallel to Norda's northern and eastern fence lines. The corner of the plant where the fence lines join is the point where X = 0 and Y = 0. Calibrated ropes and tape and rule measurements provided positional control of the grids. Measurements taken on the grid pattern provide data points, which are then contoured and zones of high magnetic anomalies are delineated. These anomalies are interpreted as zones of buried drum deposits. On the basis of the interpretations, five distinct drum deposits or drum cells were identified in the grassy area east of the rear parking lot. The cells or drum clusters were estimated as being buried to depths on the order of 5 to 10 feet below grade. In addition, a few small masses of iron were delineated in the landfill area along Murray Road. Locations of the surveyed area and locations of interpreted buried iron masses are shown in Figure 1 and are depicted in more detail in Figures 6 through 10.

4.2 TEST PITS

To confirm the results of the survey, exploratory test pits were excavated in both the drum disposal area and fill area. Test pits did not exceed a total depth of 10 feet as a precaution to prevent the possibility of piercing the surficial clay strata. As an additional environmental precautionary measure, when test pits were excavated in suspected drum areas, pits were initiated in clean areas and extended toward the drum deposits. In this manner, the risk of disturbing the drums or piercing the clay layer was minimized. Locations of the test pits with respect to the magnetic survey are shown on Figures 1 and 4 through 10. Drums were observed in test pits A, B, G, H, K, N, P, R, S, T, U, V, W, X, Y and Z. A waste, soil and water samples were obtained from test pit N for preliminary chemical analysis. The results are presented in Tables 3, 3A and 3B.

The information obtained during test pit operations confirmed the interpretations of the magnetic survey. Those areas identified in the survey as containing buried masses of iron contained buried drums. Those areas which were identified in the survey as not containing drums in fact contained no drums when explored by test pits. The grassy area along the facility's eastern fence line showed the largest magnetic anomalies and, on the basis of test pit observations, appears to contain the highest concentration of buried drums.

This backfill material is believed to exhibit a higher permeability than the natural soils. Downward percolating rainwater has accumulated in the backfill and is perched with the drums in the natural soils.

4.3 EXPLORATORY BORINGS AND MONITOR WELLS

Drilling and well installation was performed by Warren-George, Inc. of Jersey City, New Jersey. Borings were advanced using a truck-mounted Mayhew 1500 rotary rig (Monitor Well MW-4) and a truck-mounted Failing 1500 rotary drill rig (Monitor Wells MW-1, 2, 3 and 5). The rigs and downhole equipment were steam cleaned prior to drilling each of the boreholes. A total of five exploratory borings were advanced to depths ranging from 47 to 72 feet below ground surface. Each boring was converted to a monitoring well using 4-inch diameter Schedule 40 PVC pipe and 20 slot screen. Wells were constructed according to NJDEP specifications for monitor wells. A sand pack was placed around the screen, a bentonite pellet seal placed over the sand, and the remainder of the annulus was pressure grouted (tremie pipe method) with a bentonite/cement slurry. A steel protective casing with locking cap was placed over the top of each well and cemented in place. Well locations are shown on Figure 1 and boring logs and well specifications are shown on Figures 11 through 14.

Monitor wells were developed through a combination of air surging and pumping. Air surging was accomplished by lowering 2-inch PVC pipe down the well, and lowering the air hose down the inside of the 2-inch pipe. In this manner, the water bearing formation was not aerated. All work was performed under the supervision of a Dames & Moore geologist.

4.4 QUALITY ASSURANCE

Quality assurance (QA) procedures were followed during the conduct of the investigations to meet the QA requirements of NJDEP and ECRA. Features of the QA program included:

- Drilling and construction of monitoring wells in accordance with NJDEP specifications.

- o Strict protocols for collection of environmental samples. (Detailed procedures are described in text.)

- o Duplicate samples sent to two separate analytical laboratories.

- o Use of analytical laboratories which are State certified and which meet NJDEP requirements for QA in analytical procedures.

- o Transmission of samples using prescribed chain of custody procedures.

4.5 HEALTH AND SAFETY

All explorations and sampling were carried out following an approved health and safety plan. A copy of the Health and Safety Plan followed at the site investigation is included in Appendix C.

A backhoe and operator supplied by Norda were used to excavate the test pits under the supervision of a Dames & Moore geologist.

5.0 SITE GEOHYDROLOGY

Stratigraphy encountered at the site consisted of approximately 14 to 20 feet of clays and sandy clays overlying sands and gravels. Generalized geologic cross sections are shown in Figures 15 and 16. Clays are relatively plastic and of probable low permeability. This is indicated by the presence of ponding of water on the ground surface after rain and by perched water found in Test Pit N. Sands and gravels in various proportions underly the clay. Generally, these deposits tend to grade more coarse with a higher percentage of gravel with depth.

Bedrock was not encountered in any of the borings, but is believed to lie at depths on the order of 120 to 140 feet below ground surface.

A deep potable water well is located on the site as shown in Figure 1. Construction details and a well log are not available. As Norda now uses municipal water, this well is no longer used as a potable water source. However, this well continues to be used as a source of cooling water.

Ground water measurements taken on November 16, 1984 show the ground water surface is within the sands and gravels.

Well No.	PVC Elevation	Stickup of PVC (ft. above ground surface)	Ground Elevation	Depth to Ground Water (ft. below PVC)	Water Elevation
MW-1	210.50	1.68	208.82	49.93	160.57
MW-2	218.24	1.87	216.37	57.24	161.00
MW-3	202.30	1.69	200.61	40.85	161.45
MW-4	205.95	2.06	203.89	44.53	161.42
MW-5	201.35	1.51	199.84	39.68	161.67

Aquifer performance tests have not been performed on the mohitor wells. However, during well development, wells were pumped at a discharge rate of 6 gpm. At this pumping rate, MW-3 was pumped dry and MW-5 showed a drawdown of approximately five to eight feet. From these data, it can be inferred that the Norda wells are in less permeable strata than the Sandoz, JCP&L, cemetary wells and other wells in the area which are reported to lie within the buried Stream Valley aquifer.

It is possible that the permeability of strata and thus the yields of the monitor wells could be greater if coarser material is encountered at depths below the interval in which the monitor wells are screened.

6.0 SITE GROUND WATER QUALITY

Water samples were collected on-site and analyzed for the presence of contamination. One water sample was collected from the perched water found in Test Pit N and from each of the five monitoring wells on site. Each of the water samples was analyzed for the 129 USEPA priority pollutants plus the 40 peaks library search prescribed by NJDEP.

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6.1 PERCHED WATER SAMPLE

The compounds detected in the perched water sample from Test Pit N are listed in Table 3.

6.2 GROUND WATER SAMPLES

The compounds detected in the ground water samples are listed in Table 4.

The ground water flow direction in the site area, based on one set of water level measurements, is tentatively toward the southwest. The reported compounds detected in the on-site ground water monitor wells appear to be distributed at random spacially. Because only one sampling in time is available, no trend of compound concentrations with time can be established. As a result of this limited data base, no conclusions can be drawn regarding the sources, migration rates and flow directions of the compounds.

7.0 BURIED DRUMS

Five drum cells are estimated to be beneath the Norda site (Figure 1 and Figures 6 through 10). The drums are estimated to be buried between approximately 2 and 11 feet below ground surface. Soils which surround the drums are grayish brown plastic clays and sandy clays. Based upon these observations, drums within a cell are believed to be packed horizontally and in a fairly tight arrangement while the areas in between the indicated drum cells are free of drums. Test pit N, excavated at Drum Cell No. 3 was used to more fully understand the configuration and extent of the drum deposits (Figure 7 in Appendix B). The lateral extent of the drum deposits was determined by exposing the cell along two lateral axes. The vertical extent of the drum cell was determined by exposing an edge of the deposits to a depth of approximately 10 feet. Drums were observed to be stacked on their sides in at least three tiers. The areal extent of the cell is approximately 15 feet by 25 feet. Additional drums may be located beneath the existing pavement. Two stainless steel drums and one wooden drum were observed. However, the majority are Type 17-E and appeared generally to be rusted, yet intact. Drums observed in Cell No. 4 showed a higher degree of degradation.

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Gray clayey soil was used as backfill material in the drum deposit. This material exhibited a sweet odor. The area of the drum deposits is apparently more permeable than surrounding clays. Rainwater has accumulated in this material and is perched in the clays. As the excavation continued, this water flowed into the test pit. Several small masses of semi-solid, viscous material floated on this water. The water was subsequently pumped from the test pit into a bulk tanker prior to backfilling of the test pit. Soil removed from test pit N was stored on plastic sheeting until used to backfill the test pit.

Cell No. 5, located east of the plant's eastern fence line, appears to be a more random collection of buried deposits. Drums and small 5-gallon containers were observed during test pit excavations. This area contains several small depressions with sweet smelling, sticky material at the surface.

Test pits excavated in the fill area along Murray Road encountered clays with building rubble. Areas indicated by the magnetic survey to contain iron masses were explored. Isolated drums were found at several of these locations. The positions of the test pits and isolated drums are shown on Figure 10.

8.0 SAMPLING AND TESTING OF DRUM DEPOSITS

8.1 METHODS

During excavation of test pit N, samples of soil, water and waste were collected. The samples were selected from backhoe bulk samples on October 9, 1984 and delivered to New York Testing Laboratory (NYT), Westbury, New York and to Environmental Testing & Certification (ETC), Edison, New Jersey for priority pollutant and a Plus 40 scan analysis.

The following table lists the samples collected, the sample designation, analysis performed and laboratories performing the work:

Sample Material	Location	Sample Designation	Analysis	Laboratory
Gray clayey backfill	Test Pit N	TP-N-SL	Full Priority Pollutants and Plus 40 Scan	NYT ETC
Perched Water	Test Pit N	TP-N-Water	Full Priority Pollutants and Plus 40 Scan	NYT ETC
Semi Solid Waste Material	Test Pit N	TP-N-Waste	RCRA Characterization	NYT
Soil	Test Pit No. 2	TP-2-Soil	Full Priority Pollutants and Plus 40 Scan	NYT ETC

Soil samples were extracted from the test pit using a backhoe. Material in the backhoe shovel was then carefully hand packed into sample jars provided by the laboratory. Care was taken to select only that soil which had not come into contact with the shovel. Disposable PVC gloves were worn to prevent the possibility of cross contamination.

Perched water samples were obtained by slowly lowering a one-gallon sample bottle into the ponded water, taking caution to prevent agitation and aeration of the water. The water was gently transferred into the appropriate sample jars and vials and then fixed with necessary preservatives. The water sample which was to be analyzed for priority pollutant metals content was field filtered through a .45 micron filter prior to fixing with nitric acid. Disposable PVC gloves were worn to help assure each sample's chemical integrity.

Perched water sampled for determination of priority pollutant metals content was field filtered through a .45 micron filter. Disposable PVC gloves were worn during sampling procedures.

8.2 RESULTS OF ANALYSIS

Results of the analysis indicate that low level organic contamination exists at the drum disposal areas in both the gray backfill and perched water. Additionally, PCB's were found in the backfill. Similar organic and PCB contamination was observed at TP-2 but at lower levels. The results of chemical analysis that are available to date are listed in Tables 3, 3A and 3B.

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9.0 GROUND WATER SAMPLING

9.1 METHODS

Ground water samples from each monitoring well were collected on November 15, 1984. Prior to sampling, each well was purged of approximately three well volumes using a submersible pump. MW-5 was purged of approximately 15 well volumes in order to remove turbidity from the well water. Samples were collected from approximately the middle of the well screen using a clean stainless steel bailer. In between sampling points, the bailer was rinsed with distilled water, rinsed with acetone and then liberally rinsed again with distilled water. The first bailer full of ground water was discarded. Water was carefully transferred into sample bottles provided by ETC, fixed with appropriate preservatives and stored in an ice-packed shuttle for delivery to ETC. Samples collected for analysis of metals were field filtered through a .45 micron filter prior to placement in sample bottles.

Ground water samples were collected from MW-1, MW-3, MW-4 and MW-5 on November 17, 1984. Procedures were identical to those described above. Samples were delivered to NYT for the same analysis.

9.2 RESULTS OF ANALYSIS

Analysis of ground water included determination of priority pollutant content with a plus 40 scan. Results of initial analysis that are currently available are presented on Tables 4 and 4A.

10.0 SOIL COMPOSITE SAMPLES AT FIRE SITES

10.1 METHODS

Samples of soil were collected along boundaries of the two fire damaged buildings. Soil was extracted at five locations along the eastern perimeter of the fire-destroyed building using a steam-cleaned hand auger. Soil from each location was obtained from ground surface to depths of two feet. A 40 ml vial was filled at each shallow boring and additional soil placed in one liter amber jars. Disposal rubber

gloves were worn to prevent contamination of the soil by sample handlers. Sample jars, provided by ETC, were stored in an ice packed shuttle until delivery to the laboratory. All soil from these five borings were composited by the lab and a single analysis run on the composite sample.

The same procedure was followed at four sampling point locations around building No. 1, whose second floor was damaged in a 1960 fire. The location of each sampling point is indicated in Figure 1.

10.2 RESULTS OF ANALYSIS

Analytical results for these samples is pending.

11.0 CLEANUP STRATEGY

11.1 SITE CONDITIONS

The deposit of buried drums is within a silty clay layer having a natural low permeability. Previous percolation tests by the owner for septic systems all reportedly failed, thereby indicating a low permeability. Because of the low permeability, rainfall recharge and percolation through the silty clay layer is small.

Soil which was backfilled around the drums was more permeable than the surrounding undisturbed natural soil. As a result, rainfall percolation accumulated within the soil backfill intermingled with the drums. This perched water is further evidence of low permeability in the natural silty clay layer.

With an estimated average permeability of 10^{-7} cm/sec. or 0.1 ft/yr, and estimated rainfall recharge only during half the year, the average recharge through the layer would be about 0.05 ft/yr.

Soil at the edge of the drum deposit contained about 1 ppm of total volatile organics. Soil at greater distances laterally from the drum deposit is expected to contain much lower concentrations of volatile organics because of lateral dispersion.

11.2 REMOVAL SCHEME

It is anticipated to remove all drums and intermingled contaminated soils. Perched contaminated water contained within the drum deposit will also be removed. Natural soils directly adjacent to the drum deposits are expected to contain about 1 ppm or less total volatile organics and will be left in place.

Soil investigations and analytic work will be performed during the removal effort to confirm low level contaminations in natural in-place adjacent soils and to control the extent of soil removal to meet acceptable environmental standards.

The excavation will be backfilled with clean soil. After final grading the contaminated area may be covered with an impermeable cap by extending the parking lot pavement or placing appropriate fill.

11.3 ESTIMATED ENVIRONMENTAL EFFECT OF CLEANUP OPERATION

Removal of the waste drums and the intermingled contaminated soil will remove a potential contaminant source. Furthermore, by paving over or capping any residual soil remaining with low levels of contamination, potential health hazards will be minimized. The volatiles will not be free to vaporize into the atmosphere. No rainfall recharge will be available to cause leachate percolation or subsequent impairment of underlying aquifers. No surface runoff will be able to erode the low level contaminated soil because of the paved surface, thereby preventing human contact with the residual low level contaminated soil. In dry seasons the pavement will prevent fugitive dust emissions.

12.0 ESTIMATES OF MATERIAL QUANTITIES AND REMOVAL COSTS

Three distinct types of material exist in the buried drum sites. These consist of:

1. Drums together with contents.

2. Soil intermingled with the drums.

3. Water perched within the drum deposits by the surrounding natural clay strata.

12.1 NUMBER OF DRUMS

Magnetic survey interpretations revealed the approximate locations of five drum cells at the site. Test Pit N better defined the extent of cell No. 3. Using the observations made during this excavation, an estimate of the number of drums contained in cell No. 3 was made. This estimate assumes the stack of drums, four layers high, seven drums long and six drums wide represents the total number of drums in this cell. This number of drums was divided by the estimated volume of cell No. 3 that was indicated by the magnetic survey and test pit operations. The resulting "drum density" figure was used as a factor to determine the approximate number of drums at each of the other four drum cells indicated by the magnetic survey.

12.2 SOIL ESTIMATES

For the purpose of estimating, it was assumed that the drums extend to a depth of 11 feet and that a maximum of an additional three feet of soil below the drums would be removed. Assuming one foot of contamination beyond the edge of the drum deposit, the total volume of cells Nos. 1 through 5 was estimated. The actual soil removal will be determined during excavation and could vary from these estimates. See Section 11 for a discussion of perimeter soil removal. The volume of the estimated number of drums was subtracted from this figure to provide the volume of soil/backfill that would be removed.

12.3 QUANTITY OF PERCHED WATER

Additionally, approximately 2,000 gallons of perched water was noted at cell No. 3. This quantity of water per unit of cell volume is anticipated at the remaining cells since soil conditions are estimated to be similar. The cell No. 3 data were, therefore used to estimate the total quantity of water that would be perched in the remaining drum cells.

The estimated quantity of drums for each area and volumes of soil and water for removal are presented in Table 5.

12.4 ESTIMATED REMOVAL COSTS

To develop cost estimates for the drum removal in the five drum burial areas, a drum removal protocol, Appendix A, was developed. This protocol, the above site information, and chemical analysis were used as the basis for a request for quotations from three contractors experienced in site remedial actions.

Contractor estimates are considered representative of market conditions for a project to be performed in the first quarter of 1985. The contractors' data were then considered to prepare the following cost estimates:

Item	Estimate
Drum Removal and Disposal (3,100) and Soil Removal Disposal (1,300 yds)	$730,000 ±
Water Disposal (35,000 gallons)	20,000 ±
Placed Fill (2,600 yds)	39,000 ±
TOTAL	$790,000 ±

These estimates assume mobilization and implementation of:

- Site specific Health and Safety Plan requiring Level C protection for removal contractor personnel.
- Surface Water Control Plan.
- On-Site Spill Response Capability.
- Lined Drum Staging Area.
- Waste Characterization for RCRA Classification and Compatibility Analysis.
- Air Quality Monitoring as appropriate in the work zone.
- An Exclusion Zone.

- o On-site personnel and equipment decontamination.
- o Solid Waste Transportation and Disposal as a hazardous Waste.
- o Disposal at a secure chemical landfill facility.
- o Site restoration to a graded surface.

These estimates are subject to modification as additional site data and waste characterization become available. However, they are judged to be conservative since contractors costs reflect considerable analytical work for waste characterization and conservative disposal options. Based upon the plant history and the probable waste characteristics, as presented in the SES, more favorable conditions such as uniform waste chemistry and resulting compatibility are anticipated and may produce cost reductions because of increased on-site productivity. A comprehensive Cleanup Plan and related cost estimates will be developed in subsequent stages of this project.

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Should there be any questions regarding this report, please contact the undersigned.

Respectfully submitted,

DAMES & MOORE

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Partner

D. J. Supkow, Ph.D.
Senior Hydrologist

JAK/DJS:jp

ATTACHMENT 1 Dames & Moore

ETC ENVIRONMENTAL TESTING and CERTIFICATION

NOV 30, 1984

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Volatile Compounds - GC/MS Analysis Data (QR01)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
F9922	DAMES & MOORE	DMHANECRA	WMW1	841115	1110	

NPDES Number	Compound	Results: Sample Concen. ug/l	Results: MDL ug/l a	QC Replicate: First ug/l	QC Replicate: Second ug/l	QC Blank and Spiked Blank: Blank Data ug/l	QC Blank and Spiked Blank: Concen. Added ug/l	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Sample ug/l	QC Matrix Spike: Concen. Added ug/l	QC Matrix Spike: % Recov
1V	Acrolein	ND	100	ND	ND	ND	1600	89	ND	1600	79
2V	Acrylonitrile	ND	100	ND	ND	ND	160	66	ND	160	52
3V	Benzene	ND	10	ND	ND	ND	36	107	ND	36	107
4V	bis(Chloromethyl)ether	ND	10	ND	ND	ND	0	-	ND	0	-
5V	Bromoform	ND	10	ND	ND	ND	36	116	ND	36	111
6V	Carbon tetrachloride	30	10	ND	ND	ND	36	109	ND	36	113
7V	Chlorobenzene	ND	10	ND	ND	ND	36	115	ND	36	114
8V	Chlorodibromomethane	ND	10	ND	ND	ND	36	117	ND	36	115
9V	Chloroethane	ND	10	ND	ND	ND	36	97	ND	36	95
10V	2-Chloroethylvinyl ether	ND	10	ND	ND	ND	36	101	ND	36	98
11V	Chloroform	26	10	ND	ND	ND	36	107	ND	36	107
12V	Dichlorobromomethane	ND	10	ND	ND	ND	36	113	ND	36	112
13V	Dichlorodifluoromethane	ND	10	ND	ND	ND	36	70	ND	36	73
14V	1,1-Dichloroethane	ND	10	ND	ND	ND	36	106	ND	36	104
15V	1,2-Dichloroethane	47	10	ND	ND	ND	36	105	ND	36	101
16V	1,1-Dichloroethylene	ND	10	ND	ND	ND	36	100	ND	36	98
17V	1,2-Dichloropropane	ND	10	ND	ND	ND	36	106	ND	36	106
18V	cis-1,3-Dichloropropylene	ND	10	ND	ND	ND	36	105	ND	36	99
19V	Ethylbenzene	ND	10	ND	ND	ND	36	112	ND	36	114
20V	Methyl bromide	ND	10	ND	ND	ND	36	103	ND	36	119
21V	Methyl chloride	ND	10	ND	ND	ND	36	85	ND	36	83
22V	Methylene chloride	BMDL	10	13	10	BMDL	36	83	3	36	62
23V	1,1,2,2-Tetrachloroethane	ND	10	ND	ND	ND	36	101	ND	36	100
24V	Tetrachloroethylene	34	10	2	3	ND	36	111	ND	36	113
25V	Toluene	BMDL	10	ND	ND	BMDL	36	101	1	36	103
26V	1,2-Trans-dichloroethylene	ND	10	ND	ND	ND	36	114	ND	36	109
27V	1,1,1-Trichloroethane	BMDL	10	12	13	BMDL	36	88	2	36	93
28V	1,1,2-Trichloroethane	ND	10	ND	ND	ND	36	104	ND	36	103
29V	Trichloroethylene	BMDL	10	ND	ND	ND	36	108	ND	36	107
30V	Trichlorofluoromethane	ND	10	ND	ND	ND	36	99	ND	36	96
31V	Vinyl chloride	ND	10	ND	ND	ND	36	89	ND	36	90
18V	trans-1,3-Dichloropropylene	ND	10	ND	ND	ND	36	115	ND	36	111

a EPA published Method Detection Limit.

ATTACHMENT F

Attachment E-1

ETC ENVIRONMENTAL TESTING and CERTIFICATION

November 30, 1984

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds – GC/MS Analysis Data – Volatile Fraction (QR06)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
F9922	DAMES & MOORE	DMHANECRA	WMW1	841115	1110	

	Compound Name	Data: Scan Number	Data: Retention Time (Min)	Data: M.W.	Identifiers: CAS Number	Identifiers: Empirical Formula	Estimated Concen. ug/ml		
1	Dimethyl-benzene	776	31.38	106	95476	C_8H_{10}	11		
2	Dimethyl-benzene	800	32.31	106	95476	C_8H_{10}	10		

ATTACHMENT 1

E-2

ETC ENVIRONMENTAL TESTING and CERTIFICATION

NOV 29, 1984

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Volatile Compounds - GC/MS Analysis Data (QR01)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
F9917	DAMES & MOORE	DMHANECRA	WMW2	841115	1245	

NPDES Number	Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
		Sample Concen. ug/l	MDL ug/l a	First ug/l	Second ug/l	Blank Data ug/l	Concen. Added ug/l	% Recov	Unspiked Sample ug/l	Concen. Added ug/l	% Recov
1V	Acrolein	ND	100	ND	ND	ND	1600	100	ND	1600	65
2V	Acrylonitrile	ND	100	ND	ND	ND	160	91	ND	160	54
3V	Benzene	ND	10	1	ND	ND	36	106	1	36	99
4V	bis(Chloromethyl)ether	ND	10	ND	ND	ND	0	-	ND	0	-
5V	Bromoform	ND	10	ND	ND	ND	36	101	ND	36	111
6V	Carbon tetrachloride	ND	10	ND	ND	ND	36	97	380	36	93b
7V	Chlorobenzene	ND	10	ND	ND	ND	36	112	3	36	141
8V	Chlorodibromomethane	ND	10	ND	ND	ND	36	102	ND	36	128
9V	Chloroethane	ND	10	ND	ND	ND	36	114	ND	36	117
10V	2-Chloroethylvinyl ether	ND	10	ND	ND	ND	36	102	ND	36	94
11V	Chloroform	ND	10	ND	ND	ND	36	102	62	36	230b
12V	Dichlorobromomethane	ND	10	ND	ND	ND	36	105	ND	36	113
13V	Dichlorodifluoromethane	ND	10	ND	ND	ND	0	-	ND	0	-
14V	1,1-Dichloroethane	ND	10	ND	ND	ND	36	104	ND	36	98
15V	1,2-Dichloroethane	ND	10	ND	ND	ND	36	113	ND	36	85
16V	1,1-Dichloroethylene	ND	10	ND	ND	ND	36	100	ND	36	94
17V	1,2-Dichloropropane	ND	10	ND	ND	ND	36	106	ND	36	100
18V	cis-1,3-Dichloropropylene	ND	10	ND	ND	ND	36	109	ND	36	110
19V	Ethylbenzene	ND	10	ND	ND	ND	36	117	1	36	122
20V	Methyl bromide	ND	10	ND	ND	ND	36	123	ND	36	90
21V	Methyl chloride	ND	10	ND	ND	ND	36	127	ND	36	67c
22V	Methylene chloride	ND	10	ND	ND	BMDL	36	77	9	36	67
23V	1,1,2,2-Tetrachloroethane	ND	10	ND	ND	ND	36	116	ND	36	125
24V	Tetrachloroethylene	ND	10	ND	1	BMDL	36	86	4	36	99
25V	Toluene	ND	10	ND	2	BMDL	36	106	2	36	116
26V	1,2-Trans-dichloroethylene	BMDL	10	ND	ND	ND	36	103	2	36	96
27V	1,1,1-Trichloroethane	ND	10	ND	ND	BMDL	36	79	ND	36	104
28V	1,1,2-Trichloroethane	ND	10	ND	ND	ND	36	107	8	36	108
29V	Trichloroethylene	115	10	ND	ND	ND	36	104	16	36	112
30V	Trichlorofluoromethane	ND	10	ND	ND	ND	36	101	ND	36	96
31V	Vinyl chloride	ND	10	ND	ND	ND	36	126	ND	36	133
18V	trans-1,3-Dichloropropylene	ND	10	ND	ND	ND	36	103	5	36	106

a EPA published Method Detection Limit.

b Spiked samples that contain compounds present at high levels do not provide valid spike recovery data.

c Recovery variable due to sample matrix interference.

ATTACHMENT

E-3

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DEC 26, 1984

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Metals, Cyanide and Phenols - Analysis Data (QR05)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
F9918	DAMES & MOORE	DMHANECRA	WMW3	841115	0840	

PDES umber	Compound	Results: Sample Concen. ug/l	Results: MDL ug/l
1M	Antimony	ND	60
2M	Arsenic	BMDL	5
3M	Beryllium	ND	5
4M	Cadmium	ND	5
5M	Chromium	ND	10
6M	Copper	ND	10
7M	Lead	ND	50
8M	Mercury	ND	.30
9M	Nickel	BMDL	10
0M	Selenium	ND	5
1M	Silver	ND	10
2M	Thallium	ND	5
3M	Zinc	7.00	7
4M	Cyanide, Total	<25	25
5M	Phenolics, Total	61	50

F

E-4

ETC ENVIRONMENTAL TESTING and CERTIFICATION

December 18, 1984

TABLE 1: QUALITATIVE RESULTS

Tentatively Identified Organic Compounds - GC/MS Analysis Data - Base/Neutral Fraction (QR08)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
F9918	DAMES & MOORE	DMHANECRA	WMW3	841115	0840	

Compound Name	Data			Identifiers				
	Scan Number	Retention Time (Min)	M.W.	CAS Number	Empirical Formula	Estim. Concen. ug/l		
1 Unknown	33	3.6	-	-	-	39		
2 Unknown	63	4.1	-	-	-	25		
3 Unknown	522	12.2	-	-	-	21		
4 Benzoic acid, 4-methoxy, trimethylsilyl ester	686	15.1	224	2078140	$C_{11}H_{16}O_3Si$	93		
5 Dodecanoic acid	766	16.5	200	143077	$C_{12}H_{24}O_2$	23		
6 Unknown	832	17.7	-	-	-	45		
7 Unknown	864	18.3	-	-	-	15		
8 Acetic acid	957	19.9	91	645885	$C_2H_5NO_3$	33		
9 Hexanedioic acid, dioctyl ester	1343	26.8	370	123795	$C_{22}H_{42}O_4$	239		

ATTACHMENT

E-5

ETC ENVIRONMENTAL TESTING and CERTIFICATION

NOV 30, 1984

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Volatile Compounds – GC/MS Analysis Data (QR01)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
F9919	DAMES & MOORE	DMHANECRA	MW4	841115	1515	

NPDES Number	Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
		Sample Concen. ug/l	MDL ug/l a	First ug/l	Second ug/l	Blank Data ug/l	Concen. Added ug/l	% Recov	Unspiked Sample ug/l	Concen. Added ug/l	% Reco
1V	Acrolein	ND	100	ND	ND	ND	1600	89	ND	1600	79
2V	Acrylonitrile	ND	100	ND	ND	ND	160	66	ND	160	52
3V	Benzene	ND	10	ND	ND	ND	36	107	ND	36	107
4V	bis(Chloromethyl)ether	ND	10	ND	ND	ND	0	-	ND	0	-
5V	Bromoform	ND	10	ND	ND	ND	36	116	ND	36	111
6V	Carbon tetrachloride	ND	10	ND	ND	ND	36	109	ND	36	113
7V	Chlorobenzene	ND	10	ND	ND	ND	36	115	ND	36	114
8V	Chlorodibromomethane	ND	10	ND	ND	ND	36	117	ND	36	115
9V	Chloroethane	ND	10	ND	ND	ND	36	97	ND	36	95
10V	2-Chloroethylvinyl ether	ND	10	ND	ND	ND	36	101	ND	36	98
11V	Chloroform	ND	10	ND	ND	ND	36	107	ND	36	107
12V	Dichlorobromomethane	ND	10	ND	ND	ND	36	113	ND	36	112
13V	Dichlorodifluoromethane	ND	10	ND	ND	ND	36	70	ND	36	73
14V	1,1-Dichloroethane	ND	10	ND	ND	ND	36	106	ND	36	104
15V	1,2-Dichloroethane	51	10	ND	ND	ND	36	105	ND	36	101
16V	1,1-Dichloroethylene	ND	10	ND	ND	ND	36	100	ND	36	98
17V	1,2-Dichloropropane	ND	10	ND	ND	ND	36	106	ND	36	106
18V	cis-1,3-Dichloropropylene	ND	10	ND	ND	ND	36	105	ND	36	99
19V	Ethylbenzene	ND	10	ND	ND	ND	36	112	ND	36	114
20V	Methyl bromide	ND	10	ND	ND	ND	36	103	ND	36	119
21V	Methyl chloride	ND	10	ND	ND	ND	36	85	ND	36	83
22V	Methylene chloride	BMDL	10	13	10	BMDL	36	83	3	36	62
23V	1,1,2,2-Tetrachloroethane	ND	10	ND	ND	ND	36	101	ND	36	100
24V	Tetrachloroethylene	BMDL	10	2	3	ND	36	111	ND	36	113
25V	Toluene	ND	10	ND	ND	BMDL	36	101	1	36	103
26V	1,2-Trans-dichloroethylene	ND	10	ND	ND	ND	36	114	ND	36	109
27V	1,1,1-Trichloroethane	BMDL	10	12	13	BMDL	36	88	2	36	93
28V	1,1,2-Trichloroethane	ND	10	ND	ND	ND	36	104	ND	36	103
29V	Trichloroethylene	ND	10	ND	ND	ND	36	108	ND	36	107
30V	Trichlorofluoromethane	ND	10	ND	ND	ND	36	99	ND	36	96
31V	Vinyl chloride	ND	10	ND	ND	ND	36	89	ND	36	90
18V	trans-1,3-Dichloropropylene	ND	10	ND	ND	ND	36	115	ND	36	111

a EPA published Method Detection Limit.

ATTACHMENT 1

E-6

ETC ENVIRONMENTAL TESTING and CERTIFICATION

NOV 28, 1984

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Volatile Compounds - GC/MS Analysis Data (QR01)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
F9916	DAMES & MOORE	DMHANECRA	XTPNW	841109	1710	

NPDES Number	Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
		Sample Concen. ug/l	MDL ug/l *	First ug/l	Second ug/l	Blank Data ug/l	Concen. Added ug/l	% Recov	Unspiked Sample ug/l	Concen. Added ug/l	% Recov
1V	Acrolein	ND	100	ND	ND	ND	1600	82	ND	1600	69
2V	Acrylonitrile	ND	100	ND	ND	ND	160	77	ND	160	56
3V	Benzene	276	10	ND	ND	ND	36	98	ND	36	94
4V	bis(Chloromethyl)ether	ND	10	ND	ND	ND	0	-	ND	0	-
5V	Bromoform	ND	10	ND	ND	ND	36	112	ND	36	97
6V	Carbon tetrachloride	ND	10	ND	ND	ND	36	100	ND	36	98
7V	Chlorobenzene	BMDL	10	ND	ND	ND	36	92	ND	36	93
8V	Chlorodibromomethane	ND	10	ND	ND	ND	36	110	ND	36	101
9V	Chloroethane	ND	10	ND	ND	ND	36	87	ND	36	81
10V	2-Chloroethylvinyl ether	ND	10	ND	ND	ND	36	101	ND	36	90
11V	Chloroform	ND	10	ND	ND	ND	36	94	ND	36	92
12V	Dichlorobromomethane	ND	10	ND	ND	ND	36	98	ND	36	94
13V	Dichlorodifluoromethane	ND	10	ND	ND	ND	36	94	ND	36	91
14V	1,1-Dichloroethane	ND	10	ND	ND	ND	36	72	ND	36	85
15V	1,2-Dichloroethane	ND	10	ND	ND	ND	36	102	ND	36	95
16V	1,1-Dichloroethylene	ND	10	ND	ND	ND	36	88	ND	36	85
17V	1,2-Dichloropropane	ND	10	ND	ND	ND	36	97	ND	36	94
18V	cis-1,3-Dichloropropylene	ND	10	ND	ND	ND	36	103	ND	36	92
19V	Ethylbenzene	BMDL	10	ND	ND	ND	36	95	ND	36	96
20V	Methyl bromide	ND	10	ND	ND	ND	36	99	ND	36	124
21V	Methyl chloride	ND	10	ND	ND	ND	36	85	ND	36	83
22V	Methylene chloride	ND	10	ND	ND	BMDL	36	68	ND	36	79
23V	1,1,2,2-Tetrachloroethane	ND	10	ND	ND	ND	36	112	ND	36	101
24V	Tetrachloroethylene	ND	10	ND	ND	ND	36	102	ND	36	104
25V	Toluene	162	10	9	8	BMDL	36	93	ND	36	96
26V	1,2-Trans-dichloroethylene	ND	10	ND	ND	ND	36	96	ND	36	89
27V	1,1,1-Trichloroethane	ND	10	4	3	BMDL	36	78	1	36	86
28V	1,1,2-Trichloroethane	ND	10	ND	ND	ND	36	109	ND	36	99
29V	Trichloroethylene	ND	10	ND	ND	ND	36	100	ND	36	94
30V	Trichlorofluoromethane	ND	10	6	5	ND	36	90	ND	36	88
31V	Vinyl chloride	ND	10	ND	ND	ND	36	89	ND	36	86
18V	trans-1,3-Dichloropropylene	ND	10	ND	ND	ND	36	95	ND	36	101

* EPA published Method Detection Limit.

ATTACHMENT

E-7

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DEC 7, 1984

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

Acid Compounds - GC/MS Analysis Data (QR02)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
F9916	DAMES & MOORE	DMHANECRA	XTPNW	841109	1710	

NPDES Number	Compound	Results: Sample Concen. ug/l	Results: MDL ug/l [a]	QC Replicate: First ug/l	QC Replicate: Second ug/l	QC Blank and Spiked Blank: Blank Data ug/l	QC Blank and Spiked Blank: Concen. Added ug/l	QC Blank and Spiked Blank: % Recov	QC Matrix Spike: Unspiked Sample ug/l	QC Matrix Spike: Concen. Added ug/l	QC Matrix Spike: % Recov
1A	2-Chlorophenol	BMDL	250	ND	ND	ND	150	73	ND	150	90
2A	2,4-Dichlorophenol	ND	250	ND	ND	ND	150	91	ND	150	91
3A	2,4-Dimethylphenol	ND	250	ND	ND	ND	150	6[b]	ND	150	0[c,b]
4A	4,6-Dinitro-o-cresol	ND	2500	ND	ND	ND	250	76	ND	250	0[c]
5A	2,4-Dinitrophenol	ND	2500	ND	ND	ND	250	69	ND	250	0[c]
6A	2-Nitrophenol	ND	250	ND	ND	ND	150	83	ND	150	33
7A	4-Nitrophenol	ND	250	ND	ND	ND	150	109	ND	150	0[c]
8A	p-Chloro-m-cresol	ND	250	ND	ND	ND	150	68	ND	150	50
9A	Pentachlorophenol	ND	250	ND	ND	ND	150	93	ND	150	2[c]
10A	Phenol	3340	250	ND	ND	ND	150	82	ND	150	89
11A	2,4,6-Trichlorophenol	ND	250	ND	ND	ND	150	99	ND	150	75

[a] ETC established Method Detection Limit for this particular sample.

[b] Recovery normally low using EPA Protocol Method 625.

[c] No or low recovery due to sample matrix interference.

ATTACHMENT 14

E-8

ETC ENVIRONMENTAL TESTING and CERTIFICATION

DEC 8, 1984

TABLE 1: QUANTITATIVE RESULTS and QUALITY ASSURANCE DATA

BASE/NEUTRAL COMPOUNDS - GC/MS ANALYSIS DATA (QR03)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Time	Elapsed Hours
F9916	DAMES & MOORE	DMHANECRA	XTPNW	841109	1710	

NPDES Number	Compound	Results		QC Replicate		QC Blank and Spiked Blank			QC Matrix Spike		
		Sample Concen. ug/l	MDL ug/l	First ug/l	Second ug/l	Blank Data ug/l	Concen. Added ug/l	% Recov	Unspiked Sample ug/l	Concen. Added ug/l	% Re.
1B	Acenaphthene	ND	10	ND	ND	ND	100	74	ND	100	82
2B	Acenaphthylene	ND	10	ND	ND	ND	100	79	ND	100	87
3B	Anthracene	ND	10	ND	ND	ND	100	85	ND	100	88
4B	Benzidine	ND	10	ND	ND	ND	100	3.	ND	100	3.
5B	Benzo(a)anthracene	13	10	ND	ND	ND	100	36	ND	100	39
6B	Benzo(a)pyrene	ND	10	ND	ND	ND	100	77	ND	100	74
7B	Benzo(b)fluoroanthene	ND	10	ND	ND	ND	100	67	ND	100	74
8B	Benzo(ghi)perylene	ND	10	ND	ND	ND	0	-	ND	0	-
9B	Benzo(k)fluoranthene	ND	10	ND	ND	ND	100	87	ND	100	73
10B	bis(2-Chloroethoxy)methane	ND	10	ND	ND	ND	100	89	ND	100	89
11B	bis(2-Chloroethyl) ether	ND	10	ND	ND	ND	100	96	ND	100	98
12B	bis(2-Chloroisopropyl)ether	ND	10	ND	ND	ND	100	74	ND	100	84
13B	bis(2-Ethylhexyl)phthalate	ND	10	ND	ND	ND	100	94	ND	100	104
14B	4-Bromophenyl phenyl ether	ND	10	ND	ND	ND	100	77	ND	100	76
15B	Butyl benzyl phthalate	ND	10	ND	ND	ND	100	89	ND	100	99
16B	2-Chloronaphthalene	ND	10	ND	ND	ND	100	70	ND	100	83
17B	4-Chlorophenyl phenyl ether	ND	10	ND	ND	ND	100	84	ND	100	87
18B	Chrysene	ND	10	ND	ND	ND	100	86	ND	100	89
19B	Dibenzo(a,h)anthracene	ND	10	ND	ND	ND	0	-	ND	0	-
20B	1,2-Dichlorobenzene	ND	10	ND	ND	ND	100	34.	ND	100	3[illegible]
21B	1,3-Dichlorobenzene	ND	10	ND	ND	ND	100	25.	ND	100	[illegible]
22B	1,4-Dichlorobenzene	ND	10	ND	ND	ND	100	30.	ND	100	2/.
23B	3,3'-Dichlorobenzidine	ND	10	ND	ND	ND	100	37	ND	100	46
24B	Diethyl phthalate	BMDL	10	ND	2	ND	100	3.	1	100	17.
25B	Dimethyl phthalate	ND	10	ND	ND	ND	100	1.	ND	100	2.
26B	Di-n-butyl phthalate	ND	10	ND	ND	ND	100	75	ND	100	99
27B	2,4-Dinitrotoluene	ND	10	ND	ND	ND	100	101	ND	100	93
28B	2,6-Dinitrotoluene	ND	10	ND	ND	ND	100	109	ND	100	100
29B	Di-n-octyl phthalate	ND	10	ND	ND	ND	100	90	ND	100	94
30B	1,2-Diphenylhydrazine	ND	10	ND	ND	ND	100	83	ND	100	88
31B	Fluoranthene	ND	10	ND	ND	ND	100	80	ND	100	86
32B	Fluorene	ND	10	ND	ND	ND	100	81	ND	100	85

ATTACHMENT 1

State of New Jersey
Department of Environmental Protection
Division of Water Resources
1474 Prospect Street, CN-029
Trenton, New Jersey 08625

FACT SHEET
FOR DRAFT NJPDES PERMIT TO DISCHARGE INTO THE WATERS OF THE STATE OF NEW JERSEY

Permit No. NJ0003154 Date:

Name and Address of Applicant:	PPF International Inc. 140 Route 10 East Hanover Twp., Morris County New Jersey 07936
Name and Address of Facility where Discharge Occurs:	PPF International Inc. 140 Route 10 (Lot: 81, Block :96) East Hanover Twp, Morris County New Jersey 07936
Receiving Water:	unnamed water filled ditch to the Whippany River
Classification:	FW2-NT

I. DESCRIPTION OF FACILITY

The above named applicant has applied for a New Jersey Pollutant Discharge Elimination System (NJPDES) permit, to the State of New Jersey Department of Environmental Protection, Division of Water Resources to discharge into the designated receiving water. A location map of the facility is included on page 3.

The applicant manufactures fragrances, flavors and flavor extract products that would be employed in the liquor business, meat industry and food industry. The discharge consists of non-contact cooling water (16,500 GPD), boiler blowdown (3,500 GPD) and stormwater runoff. Effluent flows into an un-named water filled ditch which drains into the Whippany River, classified as FW2-NT waters in the Passaic River Basin. The average flow volume for this discharge is 500 GPD . Before being discharged, the effluent is collected in a Grit Removal Catch Tank. SIC Codes for the applicant are 2087, 2869, 2844 and 9998.

ATTACHMENT I

PERMIT SUMMARY TABLE

Company: PPF International Inc. Permit#:NJ0003154 Discharge#:001

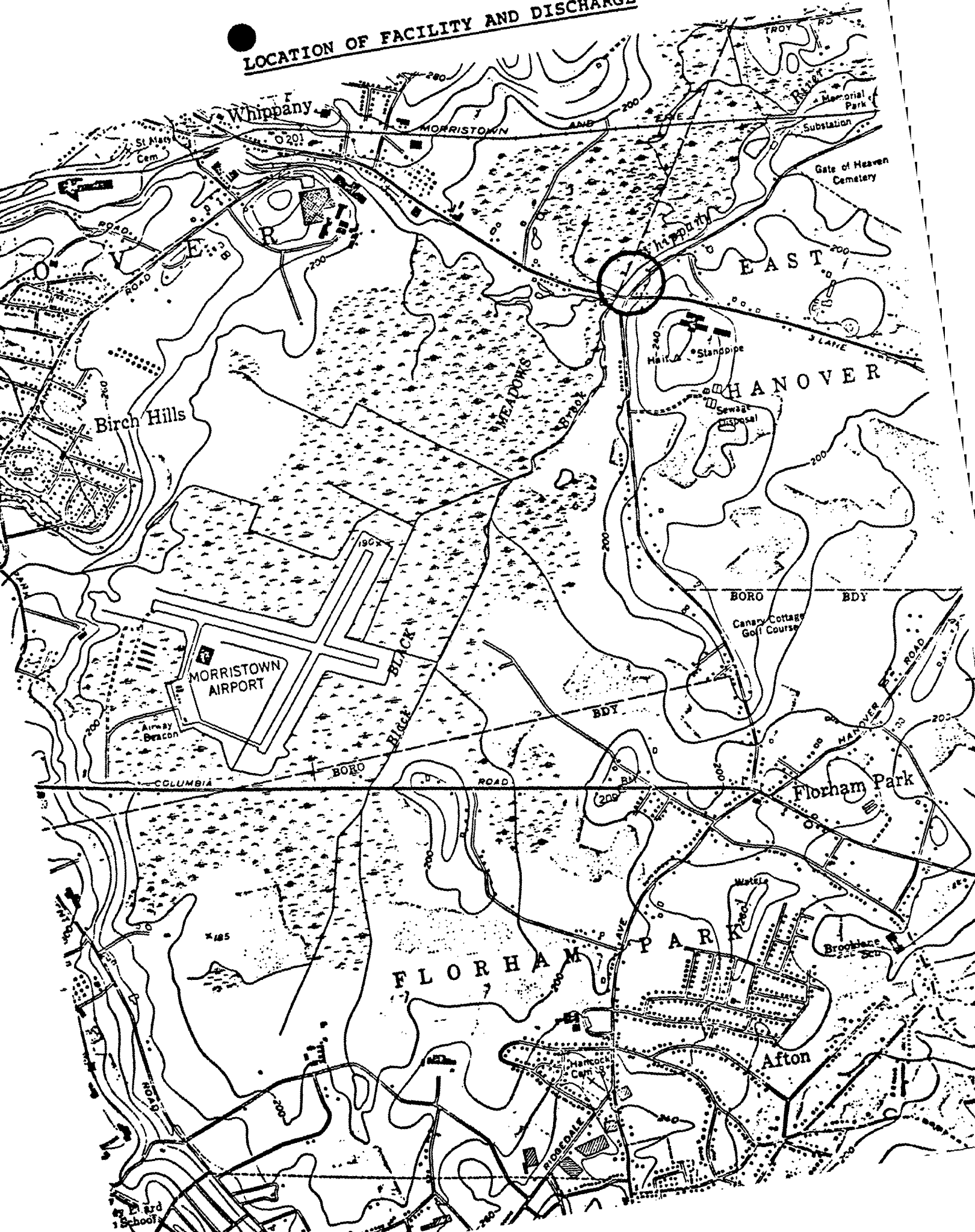
Lat: 40° 48' 45" Ave. Flow: 0.005MGD

Long: 74° 22' 35" 0.01 MGD

Parameter	Application	DMR's 6/86-9/86 min-max	Existing Permit Condition	NJ Standards	EPA Guidance and Best Professional Judgement	Draft Permit Limits
Flow (MGD)	0.024	---	monitor		---	monitor
T° C (°F)	16 ℃	9-23	32.2(90)		30(86)	30(86)
BOD_5 (mg/l)	3.0	----	----	25		monitor
COD (mg/l)	8.3	1-60	50		100	50
TSS (m/l)	11.3	<1-47	monitor		50	50
pH (S.U.)	6.7-7.8	6.6-8.4	6.0-9.0		6.0-9.0	6.0-9.0
Petroleum Hydrocarbons (mg/l)	----	1-55	10	10/15	---	10/15
Total Zinc (mg/l)	----	----	1.0		1.0	1.0
Total Copper (mg/l)	----	----	1.0		1.0	1.0

ATTACHMENT 1

LOCATION OF FACILITY AND DISCHARGE



STATEMENT OF BASIS
DRAFT NJPDES PERMIT TO
DISCHARGE INTO THE WATERS OF
THE STATE OF NEW JERSEY

NJPDES Application No. NJ0003154

DESCRIPTION OF LIMITATIONS AND CONDITIONS

Limitations for Temperatrure, pH, TSS, COD, Chromium, Copper and Zinc are based on USEPA Regional Guidance for cooling water and surface runoff discharges consistent with 402 determination and existing permit conditions.

The monitoring requirement for BOD is based on Best Professional Judgement and is imposed due to the condition of the stream noted in various compliance inspections by the NJDEP.

Limitations and monitoring requirements for Petroleum Hydrocarbons are consistent with N.J.A.C. 7-14A-14.1 et seq., the New Jersey Oil and Grease Effluent Limitations.

ATTACHMENT F

Let's protect our earth

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
CN 402
Trenton, N.J. 08625

PERMIT

The New Jersey Department of Environmental Protection grants this permit in accordance with your application, attachments accompanying same application, and applicable laws and regulations. This permit is also subject to the further conditions and stipulations enumerated in the supporting documents which are agreed to by the permittee upon acceptance of the permit.

Permit No.	Issuance Date	Effective Date	Expiration Date
NJ0003154			

Name and Address of Applicant	Location of Activity/Facility	Name and Address of Owner
PPF International Inc. 140 Route 10 East Hanover, NJ 07936	PPF Internaitonal Inc. 140 Route 10 East Hanover, NJ 07936	Same as Applicant

Issuing Division	Type of Permit	Statute(s)	Application No.
Water Resouces	NJPDES-DSW	N.J.S.A. 58:10A-et seq.	NJ0003514

This permit grants permission to:

Discharge to a tributary to the Whippany River, classified as FW2-NT waters, in accordance with the effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof.

Approved by the Department of Environmental Protection
By Authority of: George G. McCann, P.E.
Acting Director
Division of Water Resources

Arnold Schiffman, Administrator
Water Quality Management

DATE

* *The word permit means "approval, certification, registration, etc."*

(GENERAL CONDITIONS ARE ON THE REVERSE SIDE.)

Form DEP-007 (8/83)

ATTACHMENT I

New Jersey Geological Survey
Technical Memorandum 87-3

GROUND-WATER CONTAMINATION AND THE DELINEATION OF A WELL-RESTRICTION AREA IN EAST HANOVER TOWNSHIP, MORRIS COUNTY, NEW JERSEY

by

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New Jersey Department of Environmental Protection
Division of Water Resources
CN029
Trenton, NJ 08625
1987

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GROUND-WATER CONTAMINATION AND THE DELINEATION OF A WELL-RESTRICTION AREA IN EAST HANOVER TOWNSHIP, MORRIS COUNTY, NEW JERSEY

SUMMARY

1. The purpose of this Technical Memorandum is to evaluate the types, sources, distribution and movement of ground-water contamination in East Hanover Township. These data are the basis for the delineation of a Well-Restriction Area.

2. The New Jersey Department of Environmental Protection (NJDEP) is investigating 38 ground-water pollution sites within East Hanover Township and its immediate vicinity. As of July 1987, monitor wells had been installed at 25 of these sites.

3. Ground-water contaminants within East Hanover include volatile organic, base neutral, acid extractable and petroleum hydrocarbon compounds. Contamination has been detected in over 70 domestic wells, 70 monitor wells and 3 municipal-supply wells. The contamination problem involves ground water in all sections of the Township and in neighboring communities.

4. A regional ground-water contamination problem exists in the aquifers of the East Hanover area. The problem is largely the result of the discharge of industrial chemicals through subsurface disposal systems.

5. A Well-Restriction Area is necessary in East Hanover Township to prevent the use of contaminated and threatened ground-water supplies by local consumers and to help control the spread of contamination within the aquifers. Approximately 800 residences in East Hanover are using private domestic wells as their source of potable water in July 1987.

6. The East Hanover Well-Restriction Area as delineated herein encompasses the entire Township.

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BACKGROUND

East Hanover Township is located in eastern Morris County as shown in figure 1. East Hanover has a population of approximately 9,000 residents and an area of approximately 9 square miles. The Township is predominantly residential, but has concentrations of light industry on Deforest Avenue, Merry Lane and NJ Route 10. Industries include electronics, metal working and finishing, pharmaceuticals, specialty chemicals, and auto-repair facilities.

The Township water system includes four wells: well nos. 1 and 2 on Melanie Lane, no. 5 on Homestead Avenue and no. 6 on Valley Road (fig. 2). As of July 1987, the Township had not been granted a water-diversion permit from the New Jersey Department of Environmental Protection (NJDEP) for well no. 6. Municipal wells no. 3 and no. 4 are inactive due to low yields. East Hanover has water-line interconnections with the Florham Park Water Department and the Southeast Morris Municipal Utilities Authority (NJDEP, 1975). Second-tier interconnections exist with the Madison Water Department, the Chatham Water Department and the Commonwealth Water Company (which serves Millburn and Chatham Townships). Adjacent water systems are shown in figure 2. The water system in East Hanover serves approximately 8,000 people with about 1.5 million gallons per day (mgd). Approximately 800 residences in the Township continue to use domestic wells for their water supply. Most of these residences and numerous others within the Township continue to operate onsite septic systems for waste disposal.

As of July 1987, NJDEP is investigating 38 ground-water pollution sites in the East Hanover area (fig. 3). Due to the discovery of contamination in municipal well no. 2 in 1981, septic-tank and seepage-pit wastes were sampled as part of a Township-wide industrial survey. Numerous industrial disposal systems throughout the Township were determined to contain volatile organic compounds (VOCs). The owners were directed by NJDEP to install monitor wells for the purpose of delineating the extent of possible ground-water contamination. As of July 1987, monitor wells have been installed at 25 of these suspected pollution sites.

Ground-water samples have been obtained from approximately 100 monitor wells at the 25 sites with monitor wells. Additionally, ground-water samples have been obtained from approximately 100 domestic wells and East Hanover municipal well nos. 1, 2, 5 & 6. Appendix 1 shows the analyses of ground water from the municipal wells. Appendices 2-3 show the analyses of ground water from selected domestic and monitor wells. Figure 4 shows the distribution of volatile organic compounds in the ground water of the East Hanover area based on the analyses given in appendices 2-3. The concentrations of VOCs range from below minimum detection limit (BMDL) to 16,690 parts per billion (ppb). The highest concentrations of volatile organics in the unconsolidated deposits are near the intersection of Ridgedale and Deforest Avenues. As of July 1987, only five bedrock wells had been

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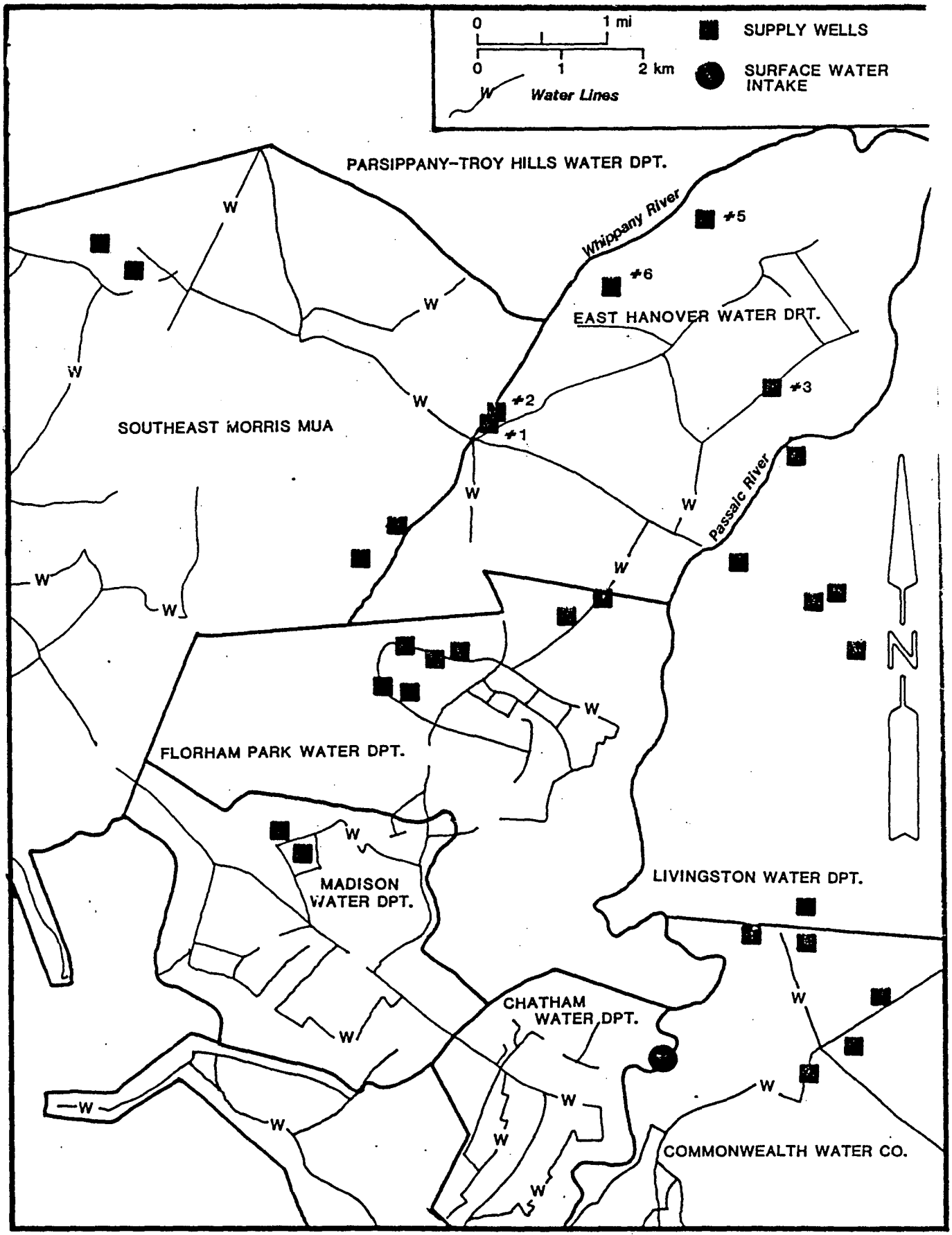

Figure 2. -- Public-water supplies in East Hanover and adjacent townships
Source: NJDEP Water Supply Overlay No. 25, 1975

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sampled. Water samples from these bedrock (Brunswick Supergroup) wells had concentrations ranging from 24.1 to 1,055 ppb total volatile organics (appendixes 2-3).

NATURE OF THE PROBLEM

Many industries in East Hanover Township manufacture, store and handle hazardous substances. These industries made use of lagoons, seepage pits and dry wells for waste disposal until public sewerage became available in 1984. Municipal-sewage wastes were subsequently directed to the Parsippany-Troy Hills Treatment Plant which is outside the boundaries of the Township. Wastes, which include volatile organics, have infiltrated from the pre-sewerage disposal systems to the underlying soil and ground water. The pumping of domestic and municipal-supply wells has probably enhanced the spread of contaminants.

Underground storage tanks have also contributed to ground-water contamination in East Hanover. Most underground tanks installed during the past 40 years have been constructed of bare steel, were largely unprotected from corrosion, and lacked any monitoring system or

Table 1. -- Mobility and partition coefficients for selected ground-water contaminants. From Verschueren (1983).

Compound	Partition[1] Coefficient (K_D)	Mobility
Volatile Organic Compounds:		
Trichloroethylene	$10^{2.29}$	High
Tetrachloroethylene	$10^{2.60}$	High
1,1,1-Trichloroethane	$10^{2.17}$	High
Benzene	$10^{2.13}$	High
Base Neutral Compounds:		
Bis (2-Ethylhexyl) phthalate	$10^{8.73}$	Low
Di-N-Butyl phthalate	$10^{9.20}$	Low
Butyl Benzyl Phthalate	$10^{4.78}$	Low

1 The partition coefficient for a given compound is the concentration of the compound sorbed (partitioned) onto the soil [s] divided by the concentration of the compound [c] in solution (K_D = [s]/[c]). Therefore, compounds with high partition coefficients will be sorbed onto soil particles, thus restricting their mobility. Mobility is proportional to the solubility and vapor pressure of the compound and inversely proportional to the partition coefficient of the compound. Base neutral and acid extractable compounds have high K_D values, are readily partitioned in soil and will be relatively immobile (USEPA, 1985).

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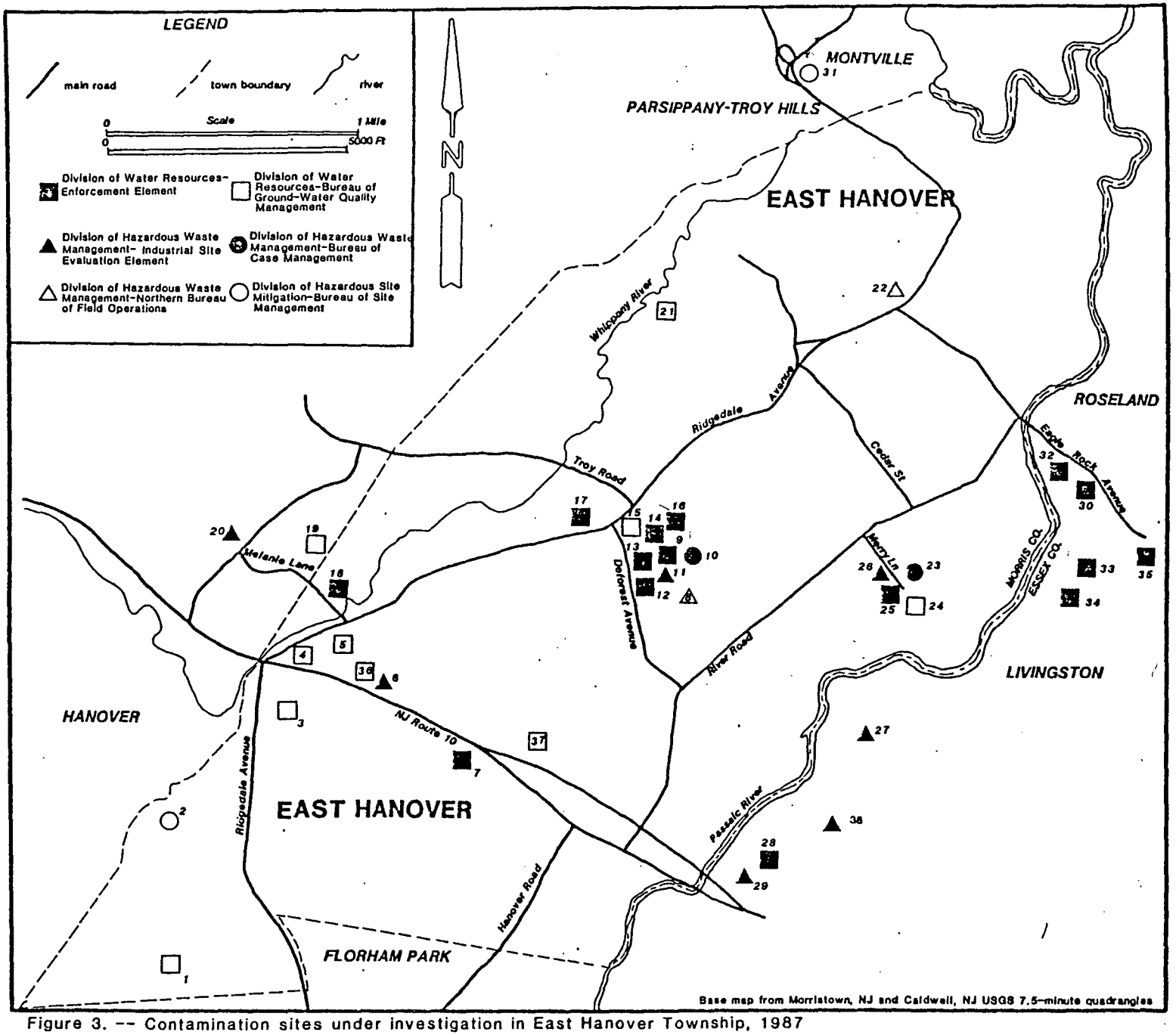

Figure 3. -- Contamination sites under investigation in East Hanover Township, 1987

1, Precision Rolled Products 2, Horstmann's Landfill 3, Sandoz Pharmaceutical 4, Hanco Wood Products 5, G & F Industrial Park 6, Norda 7, Gogol Tire Exchange 8, Nabisco 9, Prime Fabricators 10, Foster Wheeler 11, Ell-Bee Chemical 12, Sidmak Laboratories 13, Deforest Investment Park 14, Chemical Components 15, DEH Realty 16, Triangle Industrial Park 17, Bronner Manufacturing & Tool 18, Peter Cu... 20, Rowe International 21, Dashaull Landfill 22, P...

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cathodic protection. Due to age and corrosion, many underground tanks have leaked, allowing contaminants to migrate to the ground water. The contents of underground tanks in East Hanover have included gasoline and diesel fuel, fuel oils and industrial solvents. In addition, the improper handling of hazardous wastes, the burial of hazardous-waste drums and possible "midnight dumping" of wastes have also added contaminants to ground water in East Hanover.

Industrial wastes, including solvents and degreasers, have infiltrated through subsurface disposal systems into the unconsolidated deposits and subsequently to the underlying ground water. Due to low partition coefficients (K_D), the mobility of volatile organic compounds in ground water is high. The partition coefficients for some of the contaminants found in East Hanover are given in table 1.

Due to the high mobility of volatile organic compounds and the large number of contaminant sources, ground water in all sections of East Hanover is contaminated or vulnerable to contamination. Numerous plumes of volatile organics exist within the unconsolidated aquifers. As a result of their high mobility, these compounds are more likely to be induced toward a pumping well than are other compounds such as base neutrals or acid extractables. Contamination in East Hanover has affected municipal-supply wells, domestic wells and industrial-production wells. Many of the compounds detected in East Hanover's ground water are considered carcinogenic (Merck & Co., 1983).

HYDROGEOLOGY

SURFICIAL DEPOSITS

East Hanover is located within the Piedmont Physiographic Province. The surficial deposits in the Township occupy two buried valleys (Nichols, 1968) known as the East Hanover and the North Millburn Buried Valleys (figs. 5a and 5b). These valleys are the result of pre-Pleistocene bedrock incision. The valley fill is the result of the advance and retreat of two sublobes of the Wisconsinan ice sheet which covered a major part of North America. The valleys generally trend north-south, but join in the northern part of the Township. The East Hanover Valley extends north into Parsippany-Troy Hills and Montville. It also extends south into Florham Park and then trends eastward into Madison and Chatham. The North Millburn Valley extends north into Parsippany-Troy Hills with its southern part extending into Livingston and Florham Park (where it is known as the South Millburn Valley). The thickest parts of the valley fill are as much as 200 feet thick with thinner deposits found along the valley walls. The buried valley aquifers in the East Hanover area have been designated a Sole Source Aquifer by the USEPA.

The surficial deposits within the valleys are of late Wisconsinan age. They consist largely of stratified drift, but include substantial

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volumes of till. The stratified drift is comprised of glaciolacustrine sand and gravel interbedded with glaciolacustrine clay layers or lenses. The clay was deposited in Glacial Lake Passaic which covered the area during the retreat of the last glacier. A clay layer, ranging from 15 to 50 feet in thickness, extends beneath the Sharkey's Landfill site in the northern part of the Township (fig. 3). The clay acts as a confining layer. Laboratory tests on Shelby tube samples of the clay disclosed a hydraulic conductivity of 1.3×10^{-7} cm/s (R. E. Wright Associates, 1986). The clay layer is not laterally continuous, but occurs intermittently throughout the Township. Glacial till may occur above and below the stratified drift in both of the valleys shown in Figure 5b and it may act as a confining or semiconfining layer. Ablation till which accumulated within or upon the shrinking glacier consists of poorly sorted silt, sand, clay and cobbles. Lodgement till was deposited beneath the glacier directly above bedrock. Due to crushing and abrasion when deposited, lodgement till is compact and may acquire a fissile structure (Flint, 1971). Therefore, it may act as a confining or semiconfining layer for the underlying bedrock aquifer. Sublacustrine fan deposits exist outside and between the two buried valleys. These deposits consist of interbedded stratified drift and till which were deposited beneath the lake surface. These deposits may be hydraulically continuous with sands and gravels within the buried valley.

Yields of individual wells in the thickest sections of stratified drift are as high as 1,400 gpm (or nearly 2 mgd). Based on a computer model (Meisler, 1976), the highest sustainable yield for the entire East Hanover Buried Valley Aquifer is 13 mgd. The present (1987) NJDEP water allocation is 10.65 mgd. At the Sharkey Farms Landfill site, hydraulic conductivities were found to range from 2.6 to 32.5 feet/day in the stratified drift aquifer (R. E. Wright Associates, 1986). Aquifer pumping tests performed on municipal well no. 6 have shown a range of transmissivity of 15,000 - 20,000 ft^2/day. Storativity values ranged from 0.0008 to 0.06 (Geraghty & Miller, 1985). Storativity values between 0.01 and 0.3 denote water-table or unconfined conditions, and values less than 0.01 denote confined or semiconfined conditions (Freeze & Cherry, 1983). Using the following equation, the ground-water flow velocity can be determined,

$$v = \frac{K}{n_e} \frac{dh}{dl}$$

where v = the ground-water flow velocity (ft/day), K = hydraulic conductivity (ft/day), dh/dl = the hydraulic gradient and n_e = the effective porosity of the material (Fetter, 1980). Based on data obtained from numerous pollution sites, the ground-water flow velocity in the stratified drift aquifers ranges from 0.3 to 13 feet/day. Based on water-level data gathered from monitor wells throughout the Township, ground-water flow directions have been calculated and compiled in figure 5a. Additionally, assumed ground-water flow directions, based on the effects of large pumping centers and regional

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hydrogeology, are included in figure 5a. Well records including depths, screened intervals, depth to bedrock and aquifer-pumping-test data are summarized in appendix 4. Locations of these wells are shown in figure 6.

Ground-water levels in the East Hanover area have declined in the past 20 to 30 years. In the past, artesian conditions prevailed within parts of the buried valley covered by till. Municipal well no. 5 exhibited flowing-artesian conditions prior to pumping in 1972. As of 1987, the piezometric surface in the vicinity of well no. 5 had been drawn below the confining layer, preventing artesian conditions. East Hanover Township directs its municipal waste water to the Parsippany-Troy Hills Treatment Plant. The treated waste water is subsequently discharged to the Rockaway and Whippany Rivers. As a result, approximately 6 to 8 mgd is transferred outside the Township and, therefore, does not recharge the aquifer. The removal of this potential recharge combined with ground-water pumping in excess of natural recharge has led to a ground-water level decline of approximately 20 feet during the past 30 (1957-1987) years throughout much of East Hanover.

BEDROCK FORMATIONS

The surficial deposits overlie three bedrock formations of the Brunswick Supergroup of Jurassic age (145-190 million years before present): the Towaco Formation, the Hook Mountain Basalt and the Boonton Formation. The Towaco Formation occurs in the extreme northeastern portion of the Township (fig. 7). It consists of black to gray, calcareous siltstone with interbedded gray sandstone and clastic volcanics. The Hook Mountain Basalt, otherwise known as the Third Watchung Basalt Flow, trends approximately north-south through the eastern portion of the Township. The Hook Mountain is a fine to moderately coarse-grained, abundantly vesicular basalt composed of at least two distinct flow units (Puffer, 1984). In the East Hanover area, the Hook Mountain has a thickness of 200-250 feet (Darton, 1890). West of the basalt flow is the Boonton Formation, which is a highly-fractured red siltstone with interbedded layers of red, dense argillite. The dominant joint direction throughout the Brunswick Supergroup formations of this area is approximately north-south. These near-vertical planar fractures may facilitate the flow of ground water (and contaminants) in these directions within the bedrock. Large-diameter municipal and production wells drilled into the sedimentary formations of the Brunswick Supergroup have an average yield of 142 gpm, and range in yield from 4 to 650 gpm (Gill, 1965). Water-level data collected from monitor wells at the Chemical Components site (fig. 3) in April 1987 indicated that the vertical hydraulic gradient was downward from the unconsolidated deposits into the bedrock at this site. Therefore, ground water will migrate downward into the bedrock aquifer at this location. A stratigraphic column for East Hanover is given in table 2.

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predominantly 1,1,1-trichloroethane and chloroform. Domestic wells along nearby Lincoln Street have also shown contamination by 1,1,1-trichloroethane. It appears that a plume of volatile organics is emanating from the Royal Lubricants area and extends southeast toward the Passaic River.

Chemservices, Inc - Sludge samples from a septic tank at Chemservices, a tenant of Dorine Industrial Park, located on Merry Lane, were analyzed and disclosed high concentrations of chloroform (48,000 ppb) and 1,1,1-trichloroethane (2,700 ppb). Four monitor wells were installed within the industrial park. Samples analyzed from wells hydraulically downgradient of Chemservices disclosed concentrations of volatile organics as high as 1,332 ppb. The ground-water flow direction was found to be easterly toward the Passaic River.

Nabisco, Inc. - A spill of 3,500 gallons of no. 2 fuel oil occurred from a leaking underground storage tank at the Nabisco facility on River Road in 1985. Analysis of ground-water samples from 11 monitor wells on site has disclosed as much as 10 ppm of petroleum hydrocarbons in ground water. Remediation of floating product is under way in July 1987. Based on water-level measurements taken at onsite monitor wells, the ground-water flow direction prior to remediation was easterly.

SOUTHERN SECTION

Hanco Wood Products - A liquid sample from a dry well at the Hanco facility on NJ Route 10 was analyzed and found to contain 2.9 percent methylene chloride. A sludge sample contained more than 400,000 ppb of volatile organics. The Hanco facility is within 1,500 feet of contaminated municipal well no. 2. As of July 1987, monitor wells have not been installed.

Norda, Inc. - More than 4,500 55-gallon waste drums were excavated from a depth of 10 feet below the ground surface at the Norda facility on NJ Route 10. The drums were buried behind the facility around 1970. Analyzed samples from five monitor wells at the site disclosed as much as 5,000 ppb of volatile organics including 1,1-oxy bismethane, 2-propanone, trichloroethylene, toluene and methylene chloride. Norda is within 1,800 feet of contaminated municipal well no. 2. The ground-water flow direction is southwest.

WESTERN SECTION

Chemical Components/Triangle Industrial Park - Samples from seven monitor wells installed into the unconsolidated deposits at the Chemical Components, Inc. (CCI) facility on Deforest Avenue have shown contamination by volatile organic, base neutral and acid extractable compounds with total concentrations as high as 17,000 ppb. Volatile organic compounds included trichloroethylene, 1,1,1-trichloroethane and tetrachloroethylene. Base neutral and acid extractable compounds

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In East Hanover, contamination of the aquifers is ongoing as a result of direct discharges of hazardous substances to the ground water. Most of these discharges continued until the municipal sewer system became available in 1984. Residual contaminants in landfills, lagoons, seepage pits and adjacent soils continue to leach to the ground water. Although many discharges occurred prior to April 1977, the vast majority continued to occur after April 1977. Therefore, most contaminant discharges discussed in this Technical Memorandum should be considered post-Spill Act.

A determination as to the percentage of pre-Spill Act versus post-Spill Act discharges which have occurred in East Hanover is not possible as of July 1987. Detailed information concerning the quantity, concentration and the actual dates of discharge is required but may not even exist. Because of the number and variety of discharges and the difficulties of obtaining accurate discharge information from potential responsible parties, obtaining an accurate percentage of pre-Act versus post-Act discharges may in this case be impossible.

DOMESTIC-WELL CONTAMINATION

As of July 1987, approximately 800 residences in East Hanover are supplied by domestic wells. Well depths range from 50 to 150 feet below the land surface. Most are screened within the unconsolidated deposits. Contamination of domestic wells disclosed by water analysis has included trichloroethylene, tetrachloroethylene, 1,1,1-trichloroethane, benzene and trans-1,2-dichloroethylene. The highest contaminant concentrations were in samples collected near the intersection of Ridgedale and Deforest Avenues and in the residential areas near the intersection of Deforest Avenue, Troy Road and Ridgedale Avenue (fig. 4). Levels of volatile organic compounds have ranged from BMDL to 2,091 ppb (appendices 2-3). A plume of these contaminants may be emanating from the Chemical Components and Triangle Industrial Park vicinity.

Ground-water contamination has also been detected in domestic wells in the Merry Lane and Lincoln Street area (appendix 2). A plume of volatile organics is probably emanating from some or all of the following industries in this area: Royal Lubricants, Inc., Weiss-Aug, Inc., Dorine Industrial Park, Fritzsche, Dodge & Olcott, Inc., and Chemservices, Inc. Based on water-level measurements and the analyses of ground water from monitor wells at these sites, a plume of volatile organic compounds is probably migrating eastward to the Passaic River.

An additional plume of dissolved gasoline constituents is probably emanating from the Sunoco Service Station near the intersection of Ridgedale and Eagle Rock Avenues (fig. 3). Based on analyses of raw-water samples from municipal well no. 5, it is presumed that the plume is travelling southwest toward the municipal well and possibly contaminating domestic wells along its migration route.

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Ground-water contamination has been detected at low concentrations (<50 ppb) in most of the remaining parts of the Township. One factor controlling the degree of contamination detected in the domestic wells is the depth at which the well is screened. Due to the relatively high density of many of the compounds and heavy pumpage in the Buried Valley Aquifer system, the compounds are likely to descend through the aquifer to deeper unconsolidated deposits or into the bedrock. The densities of selected volatile organic compounds are shown in table 3.

Table 3. -- Density of selected ground-water contaminants. From Merck & Co. (1983). Mass per unit volume, M/L^3, where M is mass and L is length. Densities given are for 20°C.

Compound	Density gm/cm^3 at 20°C
Carbon Tetrachloride	1.5890
Tetrachloroethylene	1.5018
Trichloroethylene	1.4904
Trans-1,2-Dichloroethylene	1.4435
Methylene Chloride	1.3617
1,1,1-Trichloroethane	1.3492
Phenol	1.0700
Water	1.0000
Benzene	0.8787
Toluene	0.8660

MUNICIPAL-WELL CONTAMINATION

East Hanover operates the three municipal-supply wells identified in figure 2 and table 4. All three wells have been found to contain volatile organic compounds including trichloroethylene, trans-1,2-dichloroethylene, 1,1,1-trichloroethane and benzene as shown in appendix 1. Concentrations of volatile organic compounds in the wells ranged from BMDL to 77.9 ppb.

Treatment by air stripping was provided for well no. 2 in 1984. Well no. 1 is scheduled to be connected to this treatment system in 1987. Due to a nearby contaminant plume, well no. 6 was not granted a diversion permit by NJDEP.

Aerial photographs disclose that the site of well no. 2 was beneath the Whippany River in 1957. Between 1957 and 1967, the present location of the well was used as a landfill for waste construction materials. Possible additional sources for the VOCs include the G & F Industrial

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Park on Littel Road, Hanco Wood Products on Route 10, Norda, Inc. on Route 10 and the P. Cuva Site (an industrial park) on Melanie Road. At each of these sites, volatile organic compounds have been discharged into onsite subsurface disposal systems.

Table 4. -- Specifications of East Hanover municipal wells

Well no.	Well permit number	Date of construct-ion (mo/yr)	Screen depth* (feet)	Depth* of well (feet)	Pump capacity (gpm)**	Status in 1987
1	25-13672	5/66	100-110	130	500	In use
2	25-14205	3/67	85-115	115	1,000	In us
5	25-18268	8/72	65-85	120	900	In use
6	25-25792	3/85	75-100	110	1,000	Not in Use

* Feet below land surface; ** gpm, gallons per minute

REGIONAL GROUND-WATER CONTAMINATION

Ground-water contamination is widespread within the East Hanover area. Communities adjacent to East Hanover Township have similar water-quality problems with volatile organic compounds. Affected water supplies in nearby communities are listed below.

LIVINGSTON WATER DEPARTMENT, ESSEX CO.

Volatile organics including trichloroethylene, 1,1,1-trichloroethane and tetrachloroethylene have been detected in municipal well nos. 5, 9 and 11 ranging from 2.0 to 13.0 ppb. A source of contamination had not been identified as of July 1987, however, four ground-water contamination cases are located directly across the Passaic River in East Hanover.

ESSEX FELLS WATER COMPANY, ROSELAND, ESSEX CO.

Five municipal wells (nos. 7, 8, 10, 11 and 12) were contaminated with volatile organics including trichloroethylene, tetrachloroethylene and 1,1,2,2-tetrachloroethylene ranging from 1.0 to 347.0 ppb. The wells were removed from service in 1983. Numerous potential responsible parties (PRPs) have been identified and investigations are under way in 1987.

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FAIRFIELD REGIONAL CONTAMINATION, ESSEX CO.

Contamination has been detected in numerous domestic wells and in Fairfield municipal well nos. 2 and 7. Contaminants include trichloroethylene and carbon tetrachloride ranging in concentration from BMDL to greater than 10,000 ppb. Numerous PRPs have been determined, including Caldwell Trucking, Inc., presently a Superfund site.

MADISON WATER DEPARTMENT, MORRIS CO.

Five municipal-supply wells within Madison Borough are contaminated with trichloroethylene, tetrachloroethylene, toluene and carbon tetrachloride ranging from 1.0 to 18.0 ppb. These compounds have also been detected in numerous domestic wells. As of July 1987, no PRPs have been identified.

FLORHAM PARK WATER DEPARTMENT, MORRIS CO.

Water samples taken from within the distribution system of the Florham Park Water System, which draws water from the East Hanover Buried Valley, disclosed 2.0 ppb of carbon tetrachloride. These results have not been confirmed. As of July 1987, samples had not been taken from any of the four individual municipal wells in Florham Park.

SOUTHEAST MORRIS MUNICIPAL UTILITIES AUTHORITY, MORRIS CO.

Analyses of water samples taken from the authority's distribution system in 1986 indicated contamination by volatile organics including trans-1,2-dichloroethylene (4.0 ppb), 1,1-dichloroethane (1.5 ppb) and chloroform (5.0 ppb). Southeast Morris operates two supply wells, Black Brook nos. 1 and 2, which are located within 200 feet of the East Hanover town line. Contamination of a well supplying potable water at the adjacent Precision Rolled Products facility on Columbia Road is indicated by analyses (in 1986) showing levels of 150 ppb of VOCs (appendix 3).

CONCLUSIONS

1. Numerous ground-water pollution sources exist within and in the vicinity of East Hanover Township. The documented contaminants include volatile organic, base neutral, acid extractable and petroleum hydrocarbon compounds.

2. Contamination has been detected in the surficial aquifer(s) throughout much of the Township. Contamination has been detected in domestic, municipal, industrial-production and monitor wells.

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3. As of July 1987, samples from five bedrock wells have disclosed high concentrations of volatile organics. Due to a downward hydraulic gradient in at least parts of the Township and the presence of relatively high density compounds, the bedrock aquifer is threatened.

4. Ground water beneath East Hanover Township currently (July 1987) contains and/or is likely to contain, in the near future, contaminant concentrations above NJDEP standards and/or guidelines for potable water.

5. A Well-Restriction Area is necessary in East Hanover Township to prevent the use of contaminated and threatened ground-water supplies by local consumers and to help control the spread of contaminants within the aquifers.

6. Ground-water contaminants will continue to migrate and spread in East Hanover until remediation of the contaminant sources and the affected ground water is initiated.

WELL-RESTRICTION AREA DELINEATION

A Well-Restriction Area is an area which contains and/or is likely to contain, in the near future, contaminant concentrations above NJDEP standards and/or guidelines for potable water. For this Township, separate 5- and 10-year Well-Restriction Areas, as required by current (July 1987) NJDEP policy, are not appropriate because the Well-Restriction Area includes the entire Township of East Hanover. The Well-Restriction Area includes both the unconsolidated and bedrock aquifers. Approximately 800 residences are using private domestic wells as their source of potable water within the Well-Restriction Area. The well-restriction delineation is based on all the information contained in this Technical Memorandum and on the following conclusions and assumptions (see figs. 3, 4 and 8):

NORTHERN SECTION

Concentrations of VOCs in ground water within the northern section range from BMDL to 890 ppb. Based on water-level measurements taken at the Sunoco and Sharkey Farms sites, the ground-water flow direction is toward either the Whippany and Passaic Rivers or municipal well no. 5. Based on these flow directions, domestic wells in the northern section are threatened with contamination. Therefore, the entire northern section currently contains and/or is likely to contain contaminant concentrations above NJDEP standards and/or guidelines for potable water.

EASTERN SECTION

Concentrations of VOCs in ground water within the eastern section range

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from BMDL to 1,332 ppb. Based on water-level measurements taken at the Nabisco, Royal Lubricants, Weiss-Aug and Dorine Industrial Park sites, the predominant ground-water flow direction is eastward toward the Passaic River. Most of the domestic wells in the eastern section are hydraulically downgradient of known pollution sources or other contaminated wells. Therefore, the entire eastern section currently contains and/or is likely to contain contaminant concentrations above NJDEP standards and/or guidelines for potable water. The Passaic River is believed to act as a hydraulic boundary for shallow ground-water flow, except near large pumping centers. Therefore, the northern and eastern boundary of the recommended Well-Restriction Area is drawn at the Passaic River.

SOUTHERN SECTION

Concentrations of VOCs in ground water within the southern section range from BMDL to 4,953 ppb. Based on water-level measurements taken at the Norda, Thermocision and Sandoz sites, the ground-water flow direction is toward either the Sandoz production wells or East Hanover well nos. 1 and 2. In the eastern part of the southern section, ground-water flow is likely to be eastward to the Passaic River. Contamination by volatile organics has been detected in wells throughout the southern section (where wells are present). Ground-water contamination has been detected inside the southern section and in Florham Park to the south. Therefore, the entire southern section currently contains and/or is likely to contain contaminant concentrations above NJDEP standards and/or guidelines for potable water. As a result, the southern boundary of the recommended Well-Restriction Area is drawn at the East Hanover Township boundary. Ground-water quality data for the Florham Park area are needed to determine if an additional well-restriction area is necessary south of East Hanover.

WESTERN SECTION

Concentrations of VOCs in ground water within the western section range from BMDL to 16,691 ppb. Based on water-level measurements taken at the Chemical Components, Bronner and Ell-Bee Chemical sites, the predominant ground-water flow direction, east of the Whippany River, is westward toward the Whippany River. These pollution sites are hydraulically upgradient from most domestic wells in the western section. Analyses of ground-water samples from these domestic wells have disclosed high concentrations of volatile organics. Low but measurable concentrations of volatile organic compounds have also been detected west of the Whippany River. The Whippany River, in the western section, is assumed not to act as a hydraulic barrier. Based on soil boring logs obtained during the installation of municipal well no. 6, the Whippany River is likely underlain by an extensive layer of clay; therefore, ground water is believed to migrate underneath the river.

ATTACHMENT 1

Thus, the entire western section currently contains and/or is likely to contain contaminant concentrations above NJDEP standards and/or guidelines for potable water. As a result, the western boundary of the recommended Well-Restriction Area extends across the Whippany River to the East Hanover Township boundary. Due to a lack of water-quality data, however, the Well-Restriction Area does not extend westward into Hanover Township. Ground-water quality data for the Hanover Township area are needed to determine if an additional well-restriction area is necessary west of East Hanover.

The need for additional Well-Restriction Areas cannot be determined until ground-water quality and flow data have been obtained from East Hanover's neighboring communities. Adjacent communities suspected in July 1987 of having ground-water contamination problems include Florham Park, Whippany, Livingston and Hanover.

REFERENCES

Darton, N. H. (1890), Traps of the Newark System, U. S Geological Survey Bulletin No. 67.

Fetter, C. W. (1980), Applied hydrogeology, Charles E. Merrill Publishing Company, Columbus, OH, 488p.

Flint, R. F. (1971), Glacial and Quaternary Geology, John Wiley & Sons, New York, 892p.

Freeze, R. L. and Cherry, J. A. (1983), Groundwater, Prentice-Hall, Inc., Englewood Cliffs, NJ, 604p.

Geraghty & Miller, Inc. (1985), Installation of Valley Road production well no. 6, Consultants' report prepared for the Township of East Hanover.

Ghatge, S. L. and Hall, D. W. (1987), Geophysical investigations to determine bedrock topography in the East Hanover-Morristown area, Morris County, New Jersey, New Jersey Geological Survey Technical Memorandum (in press).

Gill, H. E. and Vecchioli, John (1965), Availability of ground water in Morris County, New Jersey, Special Report 25, New Jersey Department of Conservation and Economic Development.

Meisler, Harold (1976), Computer simulation model of the Pleistocene valley-fill aquifer in southwestern Essex and southeastern Morris counties, New Jersey, U. S. Geological Survey Water Resources Investigation Report 76-25.

Merck & Co. (1983), The Merck Index: An encyclopedia of chemicals and drugs, Tenth edition, Merck & Co., Inc., Rahway, NJ.

ATTACHMENT 1

DEQ-047

~~NORDA, INC~~ PPF Norda, Inc.

APC STACK LOG

140 Rt. 10 - East Hanover.

PLANT I.D. 25039

STACK NO.	CERTIFICATE NO.	DESCRIPTION OF EQUIPMENT	DATE LOGGED
1	~~6072~~	Exhaust System EF-1 STACK # DELETED 3/18/88 Bldg 25. - Removed	
2	72216 ~~7729~~	Exhaust System EF-1 Bldg 27	9/9/85 CN
3	75948 ~~7730~~	Exhaust System EF-2 Bldg 27 #003	
~~4~~	~~18364~~	~~Exhaust System ER-1~~ STACK # 4 ~~Bldg 1~~ DELETED 4 SEP 1985	
~~5~~	~~18365~~	~~Exhaust System ER-2~~ Bldg 1 STACK # 5 DELETED	4 SEP 1985
~~6~~	~~18366~~	~~Exhaust System ER-3~~ STACK # 6 Bldg 1 DELETED	4 SEP 1985
~~7~~	~~18367~~	~~Exhaust System ER-4~~ STACK # 7 Bldg 1 DELETED	4 SEP 1985
8	75949 83-0661	#17 - ? where ?	

APEDS USE ONLY

ATTACHMENT K

Form DEQ-062
9/87

NE[illegible]RSEY DEPARTMENT OF ENVIRONMENTAL PR[illegible]CTION
[illegible]ISION OF ENVIRONMENTAL QUALITY
[illegible]REAU OF ENFORCEMENT OPERATIONS

DATE ASSIGNED	DATE DUE
DATE COMPLETED	COUNTY
	Morris

PLANT ID #	INSPECTOR ASSIGNED

FIELD INVESTIGATION ASSIGNMENT REPORT

(wasn't sure of name)

COMPANY Parkes Inc Quest Co. (?) PPF INTERNATIONAL (NORDA)

LOCATION RT. 10, East Hanover

TYPE OF ASSIGNMENT
☒ COMPLAINT ☐ APEDS
☐ ORDER FOLLOWUP
☐ OTHER (BY CODE) _____

CDS CLASS: A1 ___ A2 ___ B ___ NSPS ___ NESHAPS ___ PSD ___

AIR GRANT (105): ☐Yes ☐No PLLT: PT ___ S2 ___ CO ___ N2 ___ VO ___ OTHER _____

COMPLAINANT NAME Ex. 6 PHONE # Ex. 6

COMPLAINANT ADDRESS Ex. 6 RECORDED BY MR

DATE RECEIVED 2/2/88 COMPLAINT DETAILS intermittent odors - sweet sick sickening

TIME RECEIVED 1:05 smell - happens at any time - been happening

PLANT CONTACT _____

TITLE _____

ARRIVAL TIME AT PLANT _____

TOTAL ASSIGNMENT TIME _____

TOTAL STACKS INSPECTED _____

TOTAL SOURCES INSPECTED _____

DEQ-012 COMPLETED FOR SUBCHAPTERS

_____ _____ _____

SUBCHAPTER	# INSP

TYPE SAMPLE COLLECTED _____ _____ _____

OF SAMPLES COLLECTED _____ _____ _____

COMMENTS (BY CODE) _____ _____ _____

COMPLAINT: TYPE _____

SUB 5 SOP FOLLOWED: ☐

TIME AT COMPLAINANT _____

VERIFIED: ☐Yes ☐No
GIVE DETAILS BELOW

VIOLATION FOLLOWUP INSPECTION

VIOLATION LOG # _____

ORDER DATED _____

SUBCHAPTER VIOLATED _____

COMPLIANCE ACHIEVED ☐Yes ☐No
GIVE DETAILS BELOW

DETAILS OF INSPECTION the past few months.

UNABLE TO CONTACT Ex. 6 - SEE ATTACHED.

The redacted information consists of names, addresses and/or phone numbers of private individuals. Disclosure of this information would constitute a clearly unwarranted invasion of personal privacy and thus is exempt from mandatory disclosure by virtue of Exemption 6 of the FOIA, 5 U.S.C. § 552(b)(6).

INSPECTOR'S SIGNATURE _____

TITLE: _____

SUPERVISOR'S REVIEW

SEE ATTACHED FOR ADDITIONAL INFORMATION: ☐Yes ☐No

INITIALS: TW DATE: 2-25-88

ATTACHMENT K

Form DEQ-062
9/87

NI[illegible]ERSEY DEPARTMENT OF ENVIRONMENTAL PR[illegible]CTION
[illegible]VISION OF ENVIRONMENTAL QUALITY
[illegible]REAU OF ENFORCEMENT OPERATIONS

FIELD INVESTIGATION ASSIGNMENT REPORT

DATE ASSIGNED	DATE DUE
2-3-88	2-5-88
DATE COMPLETED	COUNTY
2-11-88	Morris

PLANT ID #	INSPECTOR ASSIGNED
25039	086

COMPANY Quest Co. (?) (originally PP7 Norda)
LOCATION Rt. 10, East Hanover

TYPE OF ASSIGNMENT
☒ COMPLAINT ☐ APEDS
☐ ORDER FOLLOWUP
☐ OTHER (BY CODE) _____

CDS CLASS: A1 ___ A2 ___ B ___ NSPS ___ NESHAPS ___ PSD ___
AIR GRANT (105): ☐Yes ☐No PLLT: PT ___ S2 ___ CO ___ N2 ___ VO ___ OTHER ___

COMPLAINANT NAME Ex. 6 PHONE # Ex. 6
COMPLAINANT ADDRESS Ex. 6 RECORDED BY MLS
DATE RECEIVED 2/3/88 COMPLAINT DETAILS Since end of summer ('87) strong,
TIME RECEIVED 9:31 sweet, sickening odor - intermittent - happening now

PLANT CONTACT _____
TITLE _____
ARRIVAL TIME AT PLANT _____
TOTAL ASSIGNMENT TIME 48
TOTAL STACKS INSPECTED _____
TOTAL SOURCES INSPECTED _____
DEQ-012 COMPLETED FOR SUBCHAPTERS _____

SUBCHAPTER	# INSP
5	1

TYPE SAMPLE COLLECTED _____
OF SAMPLES COLLECTED _____
COMMENTS (BY CODE) _____

COMPLAINT: TYPE OD
SUB 5 SOP FOLLOWED: ☐
TIME AT COMPLAINANT 8:30
VERIFIED: ☐Yes ☒No
GIVE DETAILS BELOW

VIOLATION FOLLOWUP INSPECTION
VIOLATION LOG # _____
ORDER DATED _____
SUBCHAPTER VIOLATED _____
COMPLIANCE ACHIEVED ☐Yes ☐No
GIVE DETAILS BELOW

DETAILS OF INSPECTION at evening

SPOKE TO Ex. 6 BY PHONE, WHO DESCRIBED PERFUME-LIKE ODORS FROM SEWER.
NO ODOR ALONG TROY RD, NOR AT HANOVER WATER TREATMENT PLANT IN SEPERAL INVESTIGATIONS 2-5 THRU 2-11.
CO-ORDINATION W/ WATER RESOURCES & E. HANOVER HEALTH CURRENTLY BEING ARRANGED.

The redacted information consists of names, addresses and/or phone numbers of private individuals. Disclosure of this information would constitute a clearly unwarranted invasion of personal privacy and thus is exempt from mandatory disclosure by virtue of Exemption 6 of the FOIA, 5 U.S.C. § 552(b)(6).

INSPECTOR'S SIGNATURE
L. M.
TITLE: S.E.G

SUPERVISOR'S REVIEW
INITIALS: JW DATE: 2-25-88

SEE ATTACHED FOR ADDITIONAL INFORMATION: ☐Yes ☐No

ATTACHMENT 1

Form DEQ-062
12/81

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
BUREAU OF AIR POLLUTION CONTROL

Nordan-25039-5.1 Fib

FIELD INVESTIGATION ASSIGNMENT REPORT

ATTACHMENT 4

TYPE OF INVESTIGATION REQUIRED	INSPECTOR ASSIGNED (Code No.)	DATE ASSIGNED	REQUIRED COMPLETION DATE	ACTUAL COMPLETION DATE	COUNTY	NO.	SUBCHAPTER	UNITS/	INSPECTOR'S INITIALS
1. ☒ COMPLAINT 2. ☐ ORDER/NOP COMPLIANCE 3. ☐ APEDS 4. ☐ OTHER	Naturale 086				ESSEX	1	5	6	ln

1. COMPLAINT Date Rec'd. 1/8/82 Tel. No. 994-3633 Name [redacted]
Time 11:33 Address [redacted]

Name and Address of Alleged Violator Nova Flavor + Fragrance Lit. E. Hanover

Nature of Violation ~~Odors~~ Sticky material on all surfaces Recorded by

Investigation Results Date 1/9/82
Time 10:30

Observation Called [redacted] re: sticky substance - referred to Livingston Health Dept. Not current odors.
(continued on attached ☐ yes ☒ no)

☐ Verified
☒ Not Verified

Recommendations file

2. ORDER/NOP COMPLIANCE Company _____ Location _____

NJAC 7:27 _____ Order, NOP Dated _____ Compliance ☐ yes ☐ no

Comments _____

(continued on attached ☐ yes ☐ no)

3. APEDS Company _____ Location _____

I.D. No. _____

Inspect Stack No. _____ Cycle _____

(or Stack Nos. _____ thru _____, _____ thru _____,

_____ thru _____, *(continued on attached ☐ yes ☐ no)*

4. OTHER Company _____ Location _____

I.D. No. _____ N.J. Stack No. _____ ☐ N/A

Type of Inspection/Activity _____

Inspection Results or Activity _____

The redacted information consists of names, addresses and/or phone numbers of private individuals. Disclosure of this information would constitute a clearly unwarranted invasion of personal privacy and thus is exempt from mandatory disclosure by virtue of Exemption 6 of the FOIA, 5 U.S.C. § 552(b)(6).

(continued on attached ☐ yes ☐ no)

Supervisor's Review

Initials _____ Date _____

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

TRENTON DISPATCH

INCIDENT REPORT ☐ Radio ☑ Action Line File # 82-781 Air

☒ Citizen ☐ Police ☐ Fire ☐ Other Agency

Reported by: [redacted] Phone [redacted] Time 1635 of call.

Affiliation and/or Address [redacted]

MUNICIPALITY [redacted] County Essex

NATURE OF INCIDENT: Date 7-8-82 Time 0000 hrs of incident

☒ Complaint ☐ Smoke ☒ Odors ☐ Particulate ☒ Sewage ☐ Noise ☐ Other

☐ Emergency △ Spill △ Chem.Fire △ Explosion △ Derailment △ Rad. △ Other

Explain: Sticky material on all surfaces

Location of Incident: Norda Flavors + Fragrances Rt 10

Type of Material involved: E. Hanover

Quantity of material: _____ Source: _____

Contamination Via: ☒ Air ☐ Land ☐ Water: Receiving Water _____

Tributary to: _____

Anyone Hospitalized? ☐ Yes ◯ No Also Reported to : _____

Area being evacuated? ☐ Yes ◯ No △ Police △ Fire △ Other _____

Report Taken by Simicsak Dispatcher Dated 7-8-82 1635 hrs

The redacted information consists of names, addresses and/or phone numbers of private individuals.

Additional Information

Disclosure of this information would constitute a clearly unwarranted invasion of personal privacy and thus is exempt from mandatory disclosure by virtue of Exemption 6 of the FOIA, 5 U.S.C. § 552(b)(6).

Person (s) Contacted to report incident:

Name:	Name:
Agency:	Agency:
Telephone #	Telephone #
Call Sign	Call Sign
Pager #	Pager #
Time Notified	Time Notified

RECEIVED

JUL 13 1982

N.J. STATE DEPT. OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR POLLUTION CONTROL
METROPOLITAN FIELD OFFICE

TOWNSHIP OF EAST HANOVER
BOARD OF HEALTH
411 RIDGEDALE AVENUE
EAST HANOVER, NJ 07936

(201) 887-2706

0010-85

January 7, 1985

Mr. Robert Kunze
Dept. of Environmental Protection
Hazardous Site Mitigation Administration
8 E. Hanover Street
Trenton, N.J. 08625

Dear Mr. Kunze:

Enclosed please find a letter from a Norda Chemical employee which was sent to Mayor James Marano regarding buried materials on Norda property.

Please contact me when you have decided on a course of action.

Very truly yours,

Pat Pignatelli, Jr. MPA
Health Officer

PPjr:as
Encl.
cc: Board of Health
Mayor James Marano

ATTACHMENT L

December 17, 1984

MEMO TO: P. Pignatelli, Health Officer

FROM: James R. Marano, Mayor

SUBJECT: Norda Chemicals

Dear Pat:

Attached, please find correspondence relating to the possibility of buried materials at the Norda site. About three or four months ago, at the time of subdivision, when Norda was subdividing two parcels from their main plant tract, I received an anonymous phone call saying that Norda had used some of that subdivided land area for burial of drums. I'm not altogether certain how best to proceed with aniinvestigation since at this time no evidence beyond the two anonymous items have surfaced.

I do believe, however, that New Jersey Law referred to as the ECRA Law may have some impact upon the subdivision of that property. Please proceed with some inquiries concerning the subject matter and do so in as routine a fashion as is possible. Report to me your findings as soon as it is possible in order that we may determine, if necessary, a future course of action.

James R. Marano
Mayor

ATTACHMENT L

[redacted]-10-84

To whom it may concern,

I have reason to believe, that on the property of Honda Chemical, on R.T. #10. (I think it is East Hanover) There are buried in the ground, yes! what you fear most. Those ugly 50 Gal. drums.

When I worked at the Boonton/Parsippany Honda plant on Fanning Rd., I worked in a building where I fractionated many products that left us with residues that I bulked in 50 Gal. drums. Some were solid, semi solid. I think most were goop in viscosity.

At this time (1968) Honda was building a plant on Rt. 10, I was working the 2nd shift on Fanning Rd. I saw the tank truck driven for Essential Trucking (owned by Honda) dropping a Tanker full of Toxic waste down the Parsippany storm sewer. I asked him why he was doing that? He stated that during the day time they trucked the liquid waste down to Newark and at Orba Chemical they would drop it to a storm sewer, there it would go out to the Bay.

ATTACHMENT L

When on overtime he said he was ordered

to save trips by dropping it in load, outside the gait, in the drive way to the parking lot. (The Passippany Sewer)

He went on to tell me that the other drivers using straight, Box and Pack Trucks, were trucking my Airman ie alkalai Residue over to the new plant on RT. 10. That they were using the drums as fill.

I wouldn't be surprised if there were 500 drums buried in the ground, under the drive way in to and around from RT. 10 on into the plant.

I wonder where else besides, the passippany Sewer, the Newark Bay and under the drive ways, Nvda chemical dumped there Waste.

C.C. to the EPA

Signed,

a Still operator
in East Hanover

I'll be watching from a short distance, to see what you dig up.

ATTACHMENT V

CN 028
Trenton, N.J. 08625-0028

(609)633-1408

Let's protect our earth

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF HAZARDOUS WASTE MANAGEMENT

Michele M. Putnam
Deputy Director
Hazardous Waste Operations

John J. Trela, Ph.D., Director

Lance R. Miller
Deputy Director
Responsible Party Remedial Action

M E M O R A N D U M

TO: File

FROM: Robert Raisch, HSMS IV

SUBJECT: NORDA INC. WINDSHIELD SURVEY

On 11/4/87 the writer conducted a windshield site survey for Norda Inc. in East Hanover. The Route 10 entrance to the facility was identified by a sign that said Quest International. The rear entrance to the facility on Murray Street was identified as PPF International which is the name of the company that purchased Norda Inc. At this time it is not known if Quest is a new name or is sharing the facility with PPF International. Large piles of dirt, possibly from the ongoing site clean up and buried drum excavation, were noted at the time of the survey. The site is secured by a eight foot high fence with guarded entrances. The area the facility is located in is mostly light industrial and commercial retail.

RR:mer

ATTACHMENT M